中国电子教育学会推荐教材

全国高职高专院校规划教材·精品与示范系列

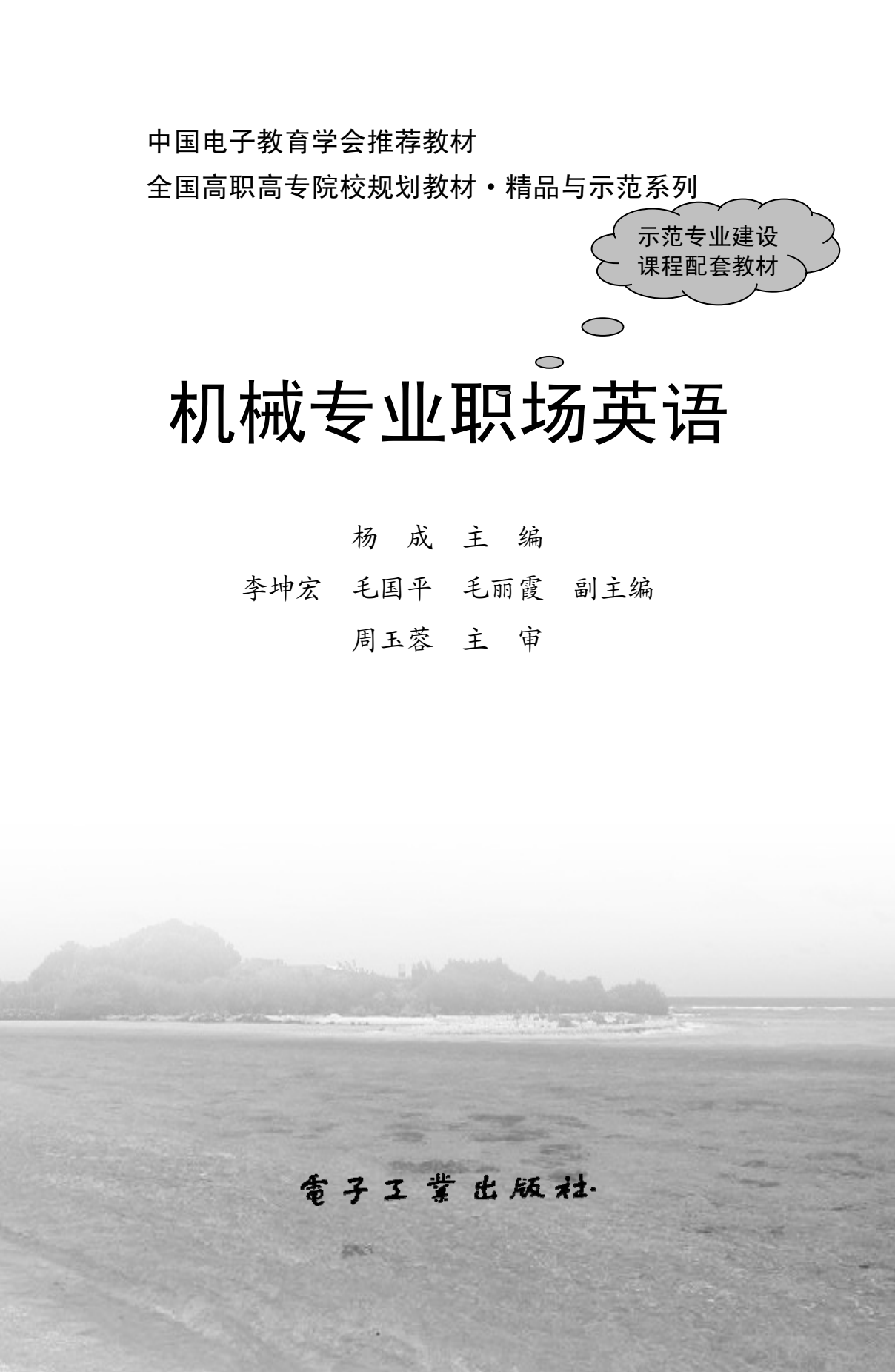
示范专业建设
课程配套教材

机械专业职场英语

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電子工業出版社

内 容 简 介

本书按照目前最新的职业教育改革要求，结合示范专业课程建设经验进行编写。本书介绍与机械类专业有关的职场英语知识，内容均选自英、美等国专业教材和专业刊物中的原文。为力求用语地道，对内容只做删减不做修改。主要内容包括：机械职场健康与安全、机械职场工具与量具、制造基础、机械加工要素、主要的机械零部件、常见的机械设备，以及机械职场阅读与写作等相关知识。

本书融汇了最新的相关专业知识，图文并茂，浅显易懂；以工作任务为驱动，通过仿真化的学习情景来完成知识模块的学习，充分体现“实用为主，够用为度”的原则。本书由职业导航、教学导航、学习材料、项目活动与任务、单词、词组、知识梳理与总结和对话练习组成。

本书可作为高职高专院校机械类专业的英语教材，也可作为应用型本科、成人教育、函授学院、民办高院、中职学校、培训班作为教材，以及企业机械类工程技术人员的参考书。

本教材配有免费的电子教学课件、课程对话录音（mp3 格式）和练习题参考答案，详见前言。

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前　言

随着经济的全球化，中国已经成为“世界工厂”，对外交流的不断深入使社会对机械类外向型人才的需求日益迫切，因此《机械专业职场英语》的出版是社会之所需。本教材顺应社会需求，按照目前最新的职业教育改革要求，结合示范专业课程建设经验进行编写。本书对传统的教学模式和课程设计进行了颠覆性的改革，具有一定的超前性，因此一定会发挥其应有的作用。

本书的编写思路如下：

（1）强化英语的素质教育功能，为学生的可持续发展夯实基础。本教材注重英语通识能力和外向型人文思维能力的培养，如听、说、读、写、译等，尤其贯彻听说领先、读写跟进的原则，重点培养学生职场英语沟通与交流的能力，为机械行业输送用得上、下得去、留得住的实用型人才。

（2）突出高职教育的特点。本教材从课程设计理念和教学设计思路，以及教学材料的选择上都经过企业调研，专家论证，学生问卷，选取真实、典型的工作场景作为学习材料，充分落实就业为导向、能力为本位、行业需求为目标，传授机械相关专业领域所需的职场英语知识和应用技能。

（3）本教材综合了英语教学法和机械类工学结合教学法进行教学设计，力求人文精神与理学思维的沟通。设计出新颖独到的职场沟通与交流仿真情景和教学案例，努力建立与专业培养目标相适应的实践教学体系，职场英语的教学采用教室（理论教学）+实作场（实践操作）的方式。

本书根据机械类专业教学的相应内容和高职教育实际情况将教材分为 6 大知识模块、41 个学习情景，设计了大量的项目活动与任务。本书的编写以“情景化，核心化，标签化”为核心宗旨，赋予生动活泼的生活情景，易学易记；只需要学习核心的职场术语就能在实际的工作中给机械零部件贴上相应的“标签”。本书对大量的职场词汇和词组给予了注解，并针对各个知识模块中的学习情景提供了大量的反馈练习，不同院校可根据实际情况对本教材内容做适当调整。

本书由重庆工业职业技术学院杨成任主编，李坤宏、毛国平和无锡南洋职业技术学院毛丽霞任副主编，参与编写的人员还有重庆工业职业技术学院曹艳霞、邓淄予、陈利竹、周晓琴、赵恒，以及浙江工业职业技术学院韩宝菊、西南财经大学统计学院杨培和黑龙江工商职业技术学院李姝彦。本书由重庆工业职业技术学院机械工程学院院长周玉蓉主审。另外丁敏、陈林珍、丁远富也给予了大力支持，在此一并表示感谢。

本书的顺利出版，要感谢重庆工业职业技术学院中澳项目办、澳大利亚职业教育与培训鉴定服务中心（VETASESS）、职业教育与监督服务中心（VETASESS）给予我们的帮助。感谢 Allen Medley，Bruce Shearer 和 Vivien Carroll 等专家的大力支持。

感谢电子工业出版社高职分社的领导和编辑给予的大力支持和帮助，并提出了许多宝贵的修改意见；本书曾参考并引用了有关文献资料、插图等，作者在此对相关作者表示由衷的感谢。

由于作者水平有限，时间仓促，写作中难免挂一漏万，不妥之处，恳请读者批评指正，并提出宝贵意见（564517580@qq.com）。

为了方便教师教学，本书还配有免费的电子教学课件、练习题参考答案和课程对话录音（mp3 格式），请有此需要的教师登录华信教育资源网（www.huaxin.edu.cn或www.hxedu.com.cn）免费注册后再进行下载，若有问题请在网站留言板留言或与电子工业出版社联系（gaozhi@phei.com.cn）。

编　者

2009 年 5 月



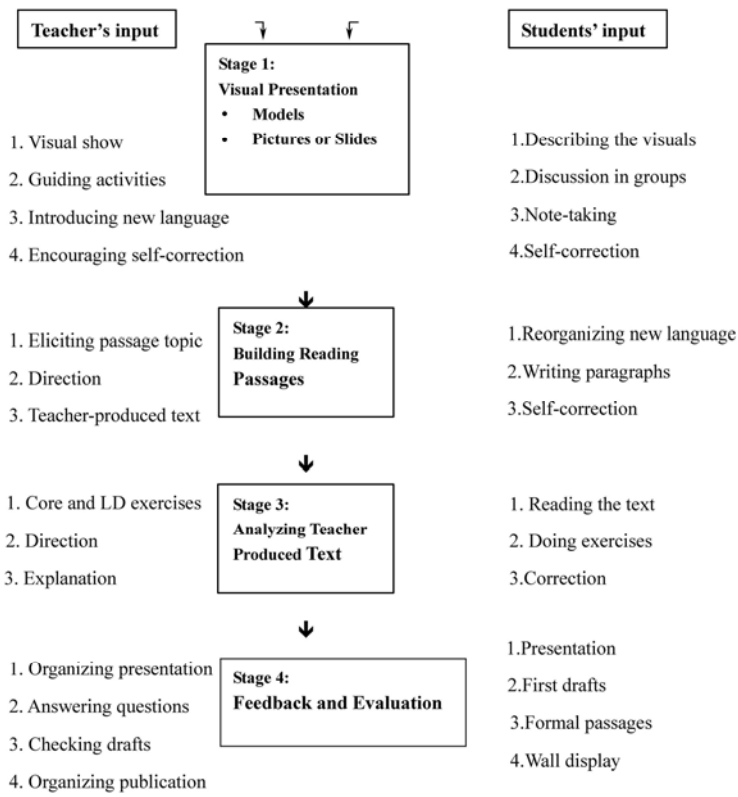
教 学 指 导

1. 教学方法建议

1）教学活动

知识模块 / 活动名称	Module I～VI	活动操作程序	建议时间
小组讨论	√	1．教师把设计好的问题（如是非判断，阅读理解等）用小纸条装在信封里，分发给各小组 2．各小组讨论 5 分钟后派代表发言 3．教师总结归纳	10～15 分钟
词汇游戏	√	根据图示识别单词、零部件	10 分钟
职场实地学习	√	实训场地，根据具体部件识别单词	20 分钟

2）Suggested Workplace Teaching Procedure



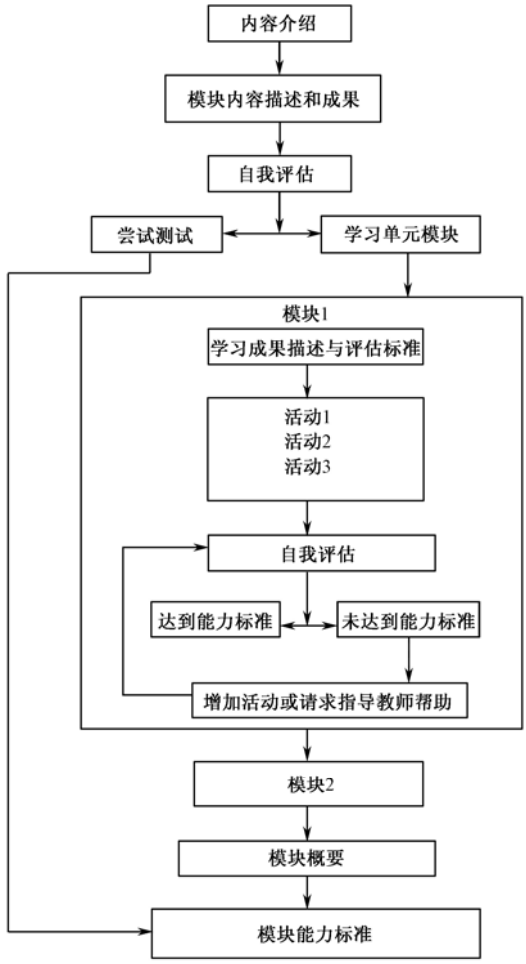
3）Teaching Equipments and Needs

（1）Multi-Media equipments including projector, computer, screen, tape-recorder, microphones, etc.

（2）T&L materials (for teachers and students), teaching plan, lectures, teaching scheme, teaching reference books, etc.

（3）Teaching models, pictures, charts, course wares, etc.

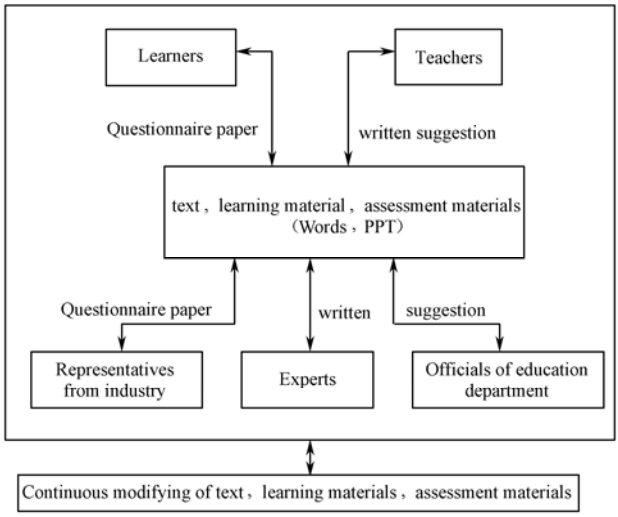
2. 模块教学步骤



3. Teaching and learning assessment methods

methods / modules	writing	spoken	observe	role-play	operation
Module I	√	√	√	√	
Module II～V			√	√	√
Module VI	√	√		√	
words and expressions	√	√	√	√	

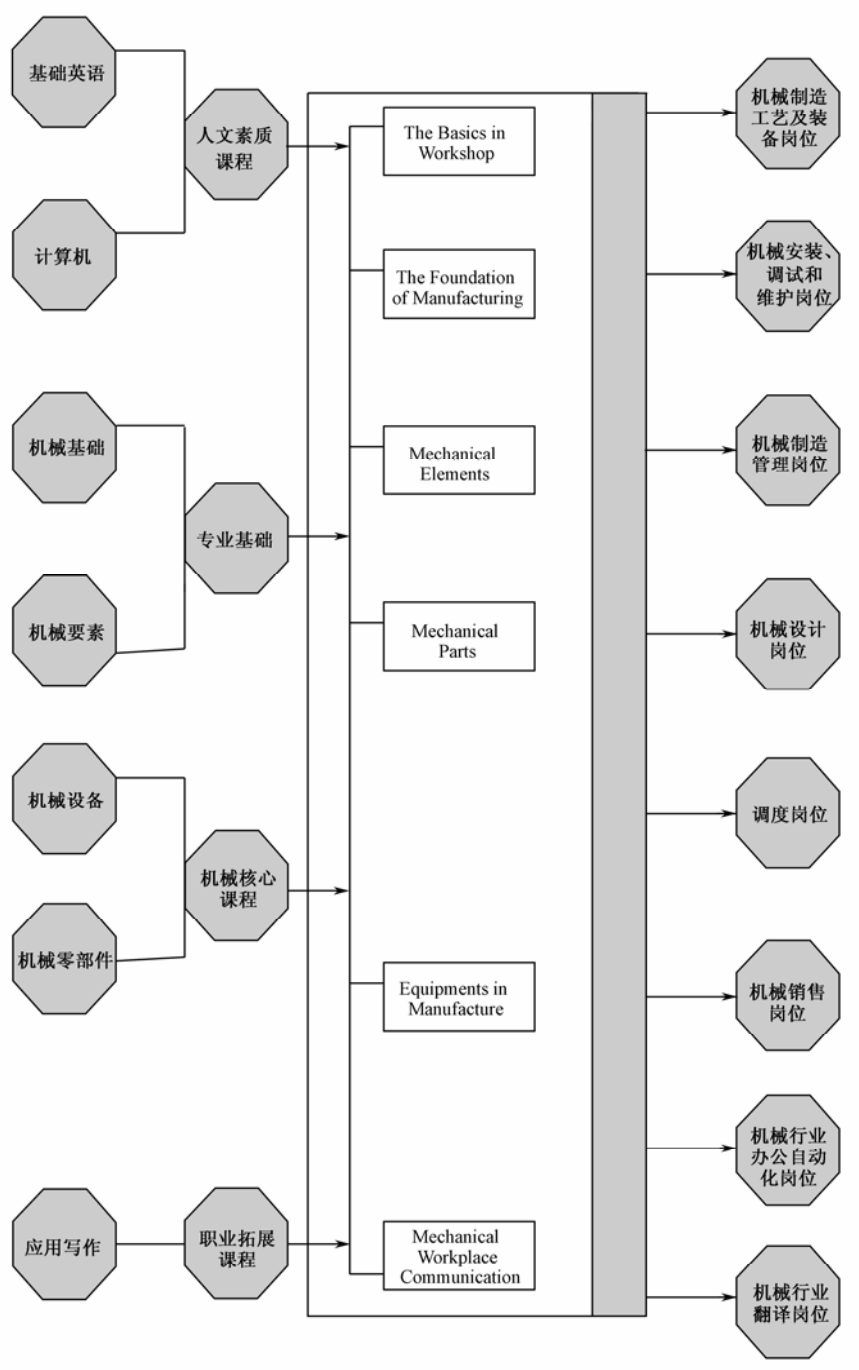
4. Teaching assessments methods



5. 教材中的图标介绍

		
scene	match words	required words
		
workplace	operation	true or false
		
compiled words	learning action	fill in blank
		
assessment	reading material	question
		
exercises	translation	group work
		
allocated time		

职业导航


基础英语
计算机
人文素质课程
机械基础
机械要素
专业基础
机械设备
机械零部件
机械核心课程
应用写作
职业拓展课程
The Basics in Workshop
The Foundation of Manufacturing
Mechanical Elements
Mechanical Parts
Equipments in Manufacture
Mechanical Workplace Communication
机械制造工艺及装备岗位
机械安装、调试和维护岗位
机械制造管理岗位
机械设计岗位
调度岗位
机械销售岗位
机械行业办公自动化岗位
机械行业翻译岗位

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Module 1

The Basics in Workshop

Guidance on teaching and learning

Teaching	VIP points	Master the basics in mechanical workplace
	Teaching methodology	Topic learning, visual memorizing, group or one-centered learning, note-taking, teamwork, presentation, questioning
	Nominal periods	8 periods
Learning	Learning methodology	In class: intensive and extensive reading ,sentence translation Out of class: fast writing, induction, deduction, self-evaluation
	Compulsory theoretic knowledge	Master the terms needed
	Learning procedure	Step 1 briefly introduce groups of workplace tools and equipments with photos by audio-visual aids or cards Step 2 introduce in groups the English words or phrases and explain each in details including names& types, description and application Step 3 check students' responses Step 4 assess the final corrections



Scene One Health and Safety in Workshop

Identifying hazards

What is a hazard?

A hazard is any situation with the potential to cause injury or illness. For example, situations that could pose hazards include: a system of work, a piece of machinery, a chemical that is used. To assist you in thinking about hazards, the following materials will break hazards into five major groups:

- Physical (e.g. plant/machine, noise, electrical, lighting, radiation, working at heights, housekeeping)
- Chemical (e.g. hazardous substances, dangerous goods)
- Ergonomic (e.g. manual handling)
- Psychological (e.g. work stressors)
- Biological

Make a survey about hazards in your workplace.

Sample hazard inspection checklist

Date of inspection: _____

Area to be inspected: _____

Checked by: _____

Floors

Safety issue	OK	Not OK	Plan to improve?
Even surface – no holes.			
Dropped objects picked up.			
Stock material out of way.			

Aisles

Safety issue	OK	Not OK	Plan to improve?
Wide enough for goods traffic.			
Adequately lit.			
Surface free from defects.			
Clear of cases, materials and rubbish.			

Fire

Safety issue	OK	Not OK	Plan to improve?
Extinguishers in place, recently serviced and clearly marked for type of fire.			
Adequate directions to fire exits.			





续表

Safety issue	OK	Not OK	Plan to improve?
Exit doors easily opened from inside.			
Exits clear of obstructions.			
Fire alarms functioning correctly.			

General lighting

Safety issue	OK	Not OK	Plan to improve?
Adequate illumination.			
Good natural lighting.			
Good light reflection from walls and ceilings.			

Windows

Safety issue	OK	Not OK	Plan to improve?
Safety or reinforced glass where appropriate.			
Clean, admitting plenty of daylight.			
No broken panes.			
Ledge free of dust, tins or rubbish.			

Storage

Safety issue	OK	Not OK	Plan to improve?
Storage designed to minimise lifting.			
Materials stored in racks and bins wherever possible.			
Shelves free of dust and rubbish.			
Stacks stable with good foundations.			
Floors around racks clear of rubbish.			
Non-skid gratings in good condition.			

Electrical

Safety issue	OK	Not OK	Plan to improve?
Gear not in use properly stored.			
No broken plugs, sockets or switches.			
Portable power tools in good condition.			

First aid

Safety issue	OK	Not OK	Plan to improve?
Cabinets and contents clean and orderly.			
Stretchers in position.			
Emergency numbers displayed.			

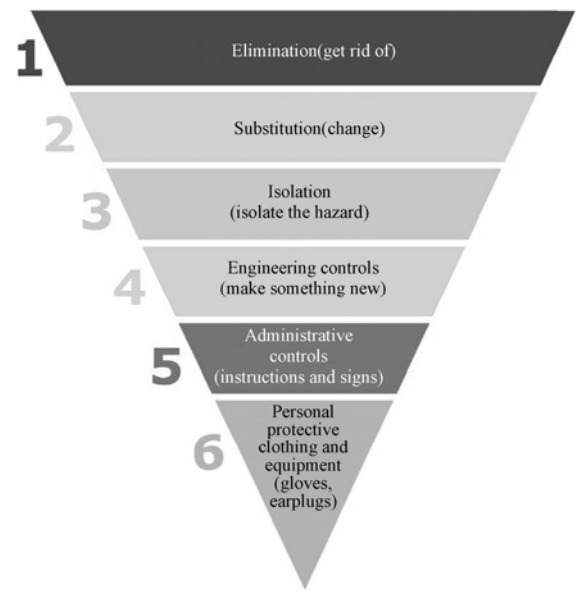
Chemical hazards

Safety issue	OK	Not OK	Plan to improve?
Are metal parts, paint brushes, etc. cleaned with turpentine, petrol or other solvents in uncovered buckets?			
Do people ever clean their hands with solvents of any type?			
Are there any hazardous chemicals in use on site?			

Ergonomics lifting/carrying

Safety issue	OK	Not OK	Plan to improve?
Do people have to lift heavy or awkward loads?			
Does the lifting involve high or low lifts?			

The hierarchy of control of hazards in workshop.



1. Elimination

Controlling risks through elimination may include, for example, eliminating toxic substances, hazardous machinery or processes that are not necessary to the way work is performed.

2. Substitution

Substitution may include, for example, substituting a toxic substance, hazardous machinery or process with one known to be less harmful to health or safety.

3. Isolation

Isolation may include, for example, enclosing or isolating a hazard such as a toxic substance by using a fume cupboard or using sound enclosure booths to control noisy machinery.

4. Engineering controls

Engineering controls may include changing processes, equipment or tools, for example:

- Installation of machine guards and machine operation controls.
- Ventilation to remove chemical fumes and dusts, and using wetting down techniques to minimize dust levels.
- Changing layout of work levels to minimize bending and twisting during manual handling.

5. Administrative controls

Administrative controls may include changing work procedures to reduce exposure to existing hazards. For example:

- Reducing exposure to hazards by job rotation.
- Limiting the number of people exposed to the hazard by limiting access to hazardous areas.

6. Personal protective clothing and equipment

Personal protective clothing and equipment include devices and clothing, such as safety clothing, footwear, helmets and earmuffs that provide individual employees with some protection from hazards.



Tick the correct response in the relevant box. True False

（1）A hazard is any situation with the potential to cause injury or illness. ☐ ☐

（2）Personal protective clothing and equipment are clothing and devices that provide employees with some protection from hazards. ☐ ☐

（3）Administrative controls may include changing work procedures to reduce exposure to existing hazards. ☐ ☐

First aid

First aid is the provision of emergency treatment and life support for people suffering injury or illness.

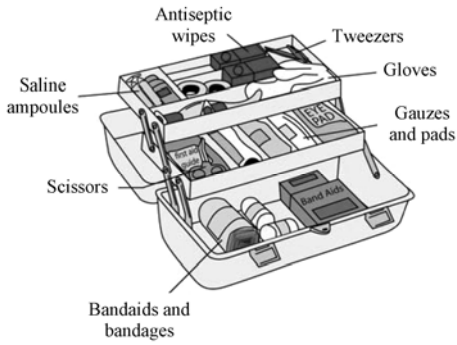
First aid aims to:

- Promote a safe environment.
- Preserve life.
- Prevent injury or illness from becoming worse.
- Help promote recovery.

- Protect the unconscious.
- Reassure the ill or injured.

Group discussion: contents list for a first aid kit.

Suggested contents for a first aid kit include



Sample contents list for a first aid kit

While the specific contents of a first aid kit will be determined from a risk assessment, the following contents list provides a basic outline:

- Emergency services telephone numbers and addresses, including local doctors and hospitals.
- Name and telephone number for workplace first aid.
- Basic first aid notes.
- Individually wrapped sterile adhesive dressings.
- Sterile eye pads.
- Sterile coverings for serious wounds.
- Triangular bandages.
- Safety pins.
- Small, medium and large sterile un-medicated wound dressings.
- Adhesive tape.
- Crepe bandages.
- Disposable gloves.
- Scissors.

Group discussion: What should we have in a first aid room?

First aid rooms

Following are the types of contents that may be needed in a first aid room:

- Resuscitation mask.
- Sink and wash basin with hot and cold water supplied.
- Work bench or dressing trolley.

- Cupboards for storage of medical supplies, dressings and linen.
- Soiled dressing containers.
- Electrical power points.
- Medical examination couch with blankets and pillows.
- Upright chairs.
- Removable screens.
- Desk and a telephone.
- Stretchers.
- First aid kit.

Tick the correct response in the relevant box. True False

（1）The definition of first aid is the provision of emergency treatment and life support for people suffering injury or illness. ☐ ☐

（2）One of the aims of first aid is to preserve life. ☐ ☐

（3）First aid can be an effective alternative to medical treatment by a doctor. ☐ ☐

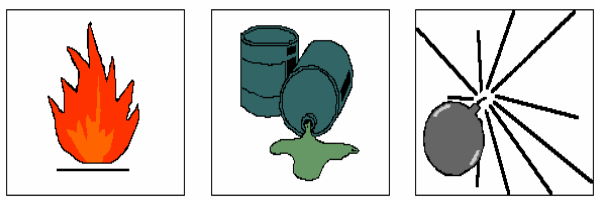
Suggested contents for a first aid kit include:

Emergency management and fire safety

The types of emergencies that could occur at a workplace depend on factors such as the type of workplace and the location of the workplace.

The types of emergencies that could occur include:

- Fire.
- Chemical spills or chemical release.
- Bomb threats.
- Structural faults in the building.
- Flooding or severe water damage.
- Threats of violence or robbery.



Examples of some of the emergencies

Fuel + heat/source of ignition + oxygen + chemical reaction = fire

Solvent + a spark + air + chemical reaction = fire



To prevent or extinguish a fire, you need to act on one of the four elements of fire:

- Source of ignition/heat.
- Fuel.
- Oxygen.
- Chemical reaction.

Examples of how to prevent fires include:

- Smoking only where permitted. Large, non-tip ashtrays should be used and everything in them should be cold before they are emptied.
- Keeping passageways and exits free from storage and waste in order to minimize combustible material.
- Promptly removing waste paper, packaging, old rags and other fire hazards.
- Ensuring that appliances (stoves, kettles etc) are switched off each night. This should include computers and computer monitors if possible.
- Making sure that any broken electrical cords or plugs are replaced immediately. If an appliance or item of equipment smells or gives off smoke, turn it off, unplug it and do not use it again until it has been checked by a qualified technician.
- Ensuring there is plenty of air circulation space around heat-producing equipment (such as photocopiers and computers).

Tick the correct response in the relevant box. True False

（1）Only about 6% of oxygen needs to be present in the air for a fire to burn. ☐ ☐

（2）If an appliance or item of equipment smells or gives off smoke, turn it off, unplug it and do not use it. ☐ ☐

（3）Smoking only where permitted. ☐ ☐

（4）Ensuring that appliances are switched off each night. This may not include computers and computer monitors if possible. ☐ ☐

Workshop dangerous goods and strategies to control

Symbols for the different classes of dangerous goods.

What do these symbols mean?



Dangerous goods are substances that may be corrosive, flammable, explosive, spontaneously combustible, toxic, oxidizing or water-reactive.

Effects on health and safety

The health and safety effects of dangerous goods are often immediate and severe.

Strategies to control dangerous goods

The preferred option to control risks arising from the use of dangerous goods is elimination.

Personal protective equipment (PPE) that includes overalls, aprons, gloves, dust masks, respirators, safety footwear, and goggles or face shields.

Tick the correct response in the relevant box. True False

（1）The preferred method of controlling risks arising from the use of dangerous goods is isolation. ☐ ☐

（2）PPE stands for personal protective equipment. ☐ ☐

Look at this picture, what forms of personal protective equipment do the man use?

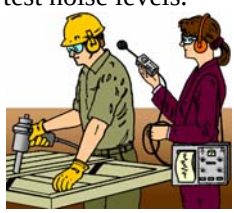
Tick the correct response in the relevant box.

☐ gloves ☐ overalls ☐ face shields ☐ goggles ☐ respirators



Noise

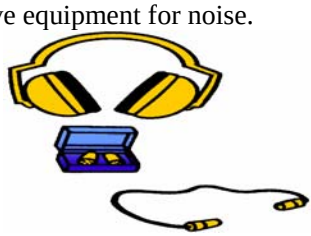
A sound level meter being used to test noise levels.



Strategies to control Noise hazards

Personal Protective Equipment

Examples of personal protective equipment for noise.



Following are some specific examples of ways to control noise:

（1）Eliminate or replace the plant or its operation with a quieter operation.

（2）Replace noisy equipment with new equipment that creates less noise.

（3）Use sound absorbing material to absorb vibration and thus reduce noise.

（4）Enclose noisy machinery or put barriers between the machinery and people.

（5）Reduce the amount of time people are exposed to noise, or use earmuffs.

Tick the correct response in the relevant box. True False

（1）A sound level meter can be used to test noise levels. ☐ ☐

（2）Noise can only cause immediate hearing loss. ☐ ☐

（3）Use sound absorbing material to absorb vibration and thus reduce noise. ☐ ☐

Practice spoken English.

Li Ying: Good afternoon,Mr.Wang.

Mr Wang: Good afternoon, Li Ying. Where are you going?

Li Ying: I am going to the library to borrow some books.

Mr Wang: What kinds of books do you want to borrow?

Li Ying: I would like to borrow some books about health and safety in workshop.

Mr Wang: Why?

Li Ying: I have been learning the course of machinery, but I have some trouble in health and safety in workshop. So I need some reference books.

Mr Wang: What are the problems? May I help you?

Li Ying: Yes, what should we pay attention to in workshop?

Mr Wang: Oh ,well, first, we should identify hazards in workplace, and then …The hierarchy of control Emergency management and fire safety, next the Workshop Dangerous Goods and Strategies to Control, lastly the noise…

Li Ying: It seems very useful knowing…

Mr Wang: Yes, you are right.

Li Ying: You are very kind, bye-bye.

Mr Wang: Bye.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Two Workplace Tools and Measuring Equipment

Workplace Tools

Hand tools——General

pry bar 撬棍



Application: *Parting component, removing seals and aligning holes.*

brush 刷子



Application: *Washing components with solvent, removing dirty from parts.*

wire brush　钢丝刷



Application: *Removing carbon rust gasket material dirt from parts.*

chisel　凿子



Application: *Cutting rivets bolts nuts and sheet steel.*

diamond-point cutter　钻石刻刀



Application: *Cleaning keyways threads and corners.*

die　板牙



Application: *Cutting external threads on rod or bolts.*

die wrench　板牙扳手



Application: *Holding and running a die during threading procedure.*

electric drill　电钻



Application: *Gripping and turning a twist drill.*

hand drill　手摇钻



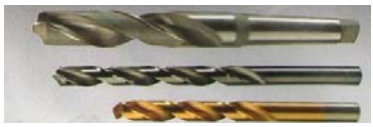
Application: As above.

twist drill 钻头



Application: *Boring holes through metal, wood and plastic.*

twist conical drill 麻花锥形钻头



Application: *Removing broken studs(stud must be drilled through its centre).*

twist fluted and straight drill 直槽钻头



Application: *As above.*

chuck 凸轮



Application: *Removing broken chips but protruding stud.*

flat file 平锉刀



Application: *Restoring surface to a flat and smooth.*

half-round file 半圆锉刀



Application: *Enlarging holes and rough finishing concave surface.*

round (rat tail) file 圆锉刀



Application: *A file with a circular cross section, used to enlarge small holes or file the inside of holes.*

small rat tail file 鼠尾细锉刀



Application: *Restoring point surfaces to condition.*

square file 方锉刀



Application: *Forming and finishing elongated notes.*

triangle file　三角锉



Application: *Restoring damaged threads .Sharpening saw teeth.*

portable grinder　便携磨具



Application: *Reducing the size of metal parts. Cutting metal parts. Preparing metal for welding.*

angle grinding　角磨具



Application: *The angle grinder is a versatile cutting, grinding, polishing and sanding machine. It is traditionally used for cutting stone and metal, but has a multitude of other uses.*

hacksaw　手锯



Application: *Used for cutting most metal objects.*

round hammer　圆锤



Application: *Rounding off rivets and bolts. Forming metal. Driving drifts pins punches and chisels.*

hand sledge hammer 手用大锤



Application: *Driving large drifts pins, collars and shafts.*

soft hammer 软锤



Application: *Hammering parts made from materials that bruise easily or have a very hard surface.*

electric heater 电加热棒



Application: *Joining steel or copper ware with resin cored solder.*

hexagon wrench 六角扳手



Application: *Loosening or tightening or set screws.*

lead light 照明灯



Application: *Illuminating the immediate work area.*

plier (combinations) 钳子



Application: *Twisting, gripping, bending and cutting most thin sheet metals or wires.*

long nose plier　尖嘴钳



Application: *Gripping and holding very small parts or fine wire.*

multi-diameter plier　多口径夹钳



Application: *Gripping and holding round parts.*

cutting pliers　切割钳



Application: *Snipping wire, small bolts or rods and split pins. Removing and replacing split pins.*

ischaemum plier　鸭嘴钳



Application: *Removing and replacing internal and external chips.*

Crocodile mouth plier　鳄嘴钳



Application: *Holding or clamping components.*

Pun ching device　冲孔器



Application: *Aligning holes more parts.*

center punching device 中心冲孔器



Application: *Indenting metal surface to locate a twist drill.*

pin punch 针式冲头



Application: *Removing tapered or straight pins.*

starter 启动器



Application: *Breaking the initial grips of a pin. Used before a pin punch.*

scraper 刮刀



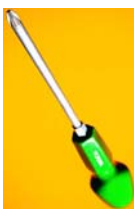
Application: *Removing carbon rust and stubborn dirt from flat surfaces.*

flat screwdriver 平口螺丝刀



Application: *Loosening and tightening screws with a standard slot in their heads.*

plum screwdriver 梅花螺丝刀



Application: *Loosening and tightening screws with a recessed cross in their heads.*

extension　加长杆



Application: *Locating the handle or speed brace in a position that clears other components or body work.*

handle-breaker bar　手闸杆



Application: *Initially loosening tight bolts or nuts.*

sliding wrench　滑动扳手



Application: *As above.*

ratchet　棘轮，棘齿



Application: *Unscrewing bolts or nuts when space around them is limited.*

universal joint　万向节



Application: *Allows a slight misalignment between a handle and socket.*

sleeve die (standard)　普通型套筒扳手



Application: *Used with a handle to loosen or tighten bolts or nuts.*

sleeve die (extra deep)　加深型套筒



Application: *Loosening or tightening components or nuts fitted some distance from the end of their studs.*

spark plug sleeve wrench 火花塞套筒扳手



Application: *Loosening or tightening spark plugs.*

impact sleeve 冲击套筒



Application: *Used with an impact wrench to loosen or tighten bolts or nuts.*

open end(flat) 双开口扳手



Application: *Loosening or tightening bolts or nuts located in a confined space.*

double plum wrench 双梅花扳手



Application: *Loosening or tightening bolts or nuts that have confined space above them.*

combination wrench 两用扳手



Application: *Has the advantages of both types of spanners.*

tap(hand) 丝锥



Application: *Using with a handle to cut a thread in a hole boring through or into most materials.*

tap wrench handle 丝锥扳手手柄



Application: *Holding and turning a tap during a threading process.*

T wrench　T 形扳手



Application: *As above.*

clamp　夹钳



Application: *Shearing or cutting most sheet metals or thin materials.*

toolbox　工具箱



Application: *Holding, separating and transporting hand tools.*

wrench(adjustable)　活动扳手



Application: *Substituting for the correct spanner.*

pipe clamp　管子钳



Application: *Gripping and turning cylindrical shapes.*

Hand tools—specialized

grease gun　润滑油枪



Application: *Lubricating ball joints with grease.*

impact screwdriver 气动螺丝刀



Application: *Loosening extremely tight screws.*

impact wrench 气动扳手



Application: *Removing and replacing bolts or nuts at a fast rate.*

oil wrench 机油扳手



Application: *Removing an oil filter.*

oil gun(hand) 手动油枪



Application: *Withdrawing oil from a component or inserting oil into a component.*

pipe cutter 管子切割器



Application: *Cutting the end of steel or copper tubing so that it is square.*

pipe enlarge device (single & double) 管子扩孔器



Application: *Forming a uniform lip(flare) on the end of a steel or copper tube(pipe).*

Forming a double thickness lip(flare) on the end of a steel or copper tube(pipe).

piston ring compressor　活塞环压缩器



Application: *Clamping piston rings firmly into their piston grooves during the installation of the piston into its bore.*

rotary brush　旋转刷



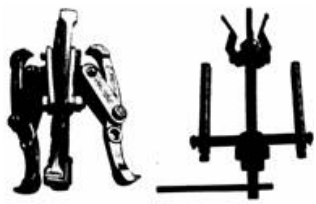
Application: *Used with an electric drill to remove carbon from the combustion chambers and ports of a cylinder head.*

seal puller　油封拉拔器



Application: *Removing oil seals.*

steering wheel pulling device　转向盘拉拔器



Application: *Removing steering wheels.*

wheel cylinder clamp　车轮卡钳



Application: *Holding wheel cylinder pistons in their bores while the brake shoes and return springs have been removed.*

wheel (hub) puller　轮毂拉拔器



Application: *Removing hubs from spliced or tapered axle shaft ends.*

tie screw wrench 轮胎螺丝扳手



Application: *Loosening or tightening wheel nuts or screws. Those fitted with a blade are used to pry off hub caps.*

Hand Tools and Equipment

1. Type, Quality and Selection

An important part of the automotive repair industry is the type, quality and selection of hand tools and equipment. Hand tools are classed as those tools which can be held or supported by the operator's hands while they are being used. Equipment is defined as being those devices which are controlled by an operator but supported by the floor building or vehicle.

2. Service and Maintenance

When using all tools and equipment, the safety aspect is extremely important. Tools and equipment used for the purpose for which they were intended will not be a risk to the operator, his or her workmates or the component parts or the vehicle. It is the responsibility of the operator and the workshop manager to service and maintain all tools and equipment.

Three Groups: There are three groups related to the types of hand tools. Which include electrical automatic and mechanical? These groups are:

（1）General

- Used on a wide range of jibs;
- They are the responsibility of the tradepeople;
- Their length is limited to approximate 0.5m.

（2）Specialized

- Designed for a particular job;
- They are the responsibility of the workshop manager;
- Their length may be greater than 0.5m.

（3）Measuring instruments

- These are very accurate measuring device;
- They are responsibility of workshop manager. Although some trades people do supply their own;
- They are generally short than 0.5m.

Good quality hand tools and equipment will make sure that the jobs in the workshop can be completed without delay and to a high standard. Before an item is purchased, care must be taken that it will:

-do the required job (suitability);

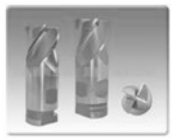
-last for a long time (durability);

-operate correctly each time it is used (reliability).

The ability to quickly select the correct hand or equipment to complete a job successfully is achieved through practice. The aim of tool selection is to make ready all the tools needed for the job before work is started. This reduces the time spent “looking for tools”.

Workplace Measuring Equipment

small air ball gauge　小空球量规



Application: *Used with an outside micrometer for measuring the inside diameters of small holes or bores.*

water temperature detector　水温检测仪



Application: *Testing a cooling system for leaks. Testing a radiator cap pressure setting.*

pressure gauge　压力表



Application: *Testing the pressure created during the compression phase in an engine.*

dial indicator　百分表



Application: *Measuring small distances between* 0.01mm *and* 10mm, *for example a bend in a crankshaft (very accurate).*

external micrometer　外径千分尺



Application: *Measuring external diameters or lengths from* 0.01mm *to* 100mm*, for example the diameter of a piston skirt(very accurate).*

feeler gauge 塞尺



Application: *Measuring small clearances or gaps that exist between two components. For example used to measure tappet clearance.*

inside caliper 内卡钳



Application: *Used with a steel rule for measuring internal dimensions of components. For example'measuring the inside diameter of exhaust tubing.*

inside micrometer 内径千分尺



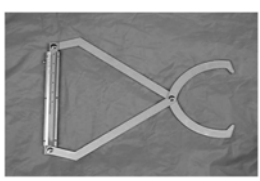
Application: *Used with an external micrometer for measuring the internal dimensions of components, for example to measure the diameter of a cylinder bore (very accurate)*

oil pressure gauge 油压计



Application: *Testing the oil pressure of running engine.*

outside caliper 外卡钳



Application: *Used with a steel rule for measuring the external dimensions of components. For example to measure the outside diameter of exhaust tubing.*

pressure vacuum gauge 真空压力表



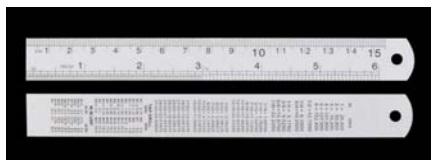
Application: *Testing the pressure and vacuum of a mechanical fuel pump. Testing the inlet manifold vacuum of a running engine.*

sparking-plug gauge 火花塞规



Application: *Measuring the gap that exists between the of a spark plug. Adjusting the gap of a spark plug.*

steel ruler 钢尺



Application: *Measuring the dimensions of component(least accurate of measuring devices).*

steel tape 钢卷尺



Application: *Measuring distances that are greater than one metre.*

straight-edge ruler 直尺



Application: *Used with a feeler gauge for measuring the twist or buckle(distortion) of a flat surface.*

electric tension wrench 电子扭矩扳手



Application: *Setting the tension of bolts or nuts to a given value.*

vee block V 形块



Application: *Used with a flat surface for supporting a round or cylindrical component during a measuring task. For example checking a camshaft for bend.*

vernier caliper 游标卡尺



Application: *Measuring dimensions of most types of shapes and depth of holes to within* 0.02mm*(very accurate).*

electrical ammeter 电流表



Application: *Measuring current flow in a given electrical circuit.*

battery discharge tester 蓄电池放电检测仪



Application: *Testing the condition of a battery by placing it under load.*

hydrometer tester 液压表



Application: *Testing the specific gravity of the electrolyte in various cells of a battery.*

low voltage tester 低电压表



Application: *Checking the existence of a voltage supply to an electrical component.*

ohmmeter　电阻表



Application: *Testing the resistance of an electrical component that has been disconnected or removed from its circuit.*

multi-meter　万用表



Application: *Testing amps, ohms and volts related to the components in a given electrical circuit.*

voltmeter　电压表



Application: *Measuring the voltage drop across an electrical component when the circuit is turned on.*

air compressor　空气压缩机



Application: *Pressuring and storing air to ensure a steady supply at a* 550～850kps.

battery charger　充电器



Application: *Charging a battery either in or out. Charging several batteries out of the vehicles.*

bench grinder　台式砂轮机



Application: *Removing material from small metal components. Sharpening hand tools.*

electric welder 电焊机



Application: *Welding most metals with an electrode held in its hand piece.*

All service and repair jobs require analysis, diagnosis and measurement to determine the cause of the trouble. After disassembly, a regular series of steps are repeated to determine each component's serviceability. To reassemble and install engine components, make exact measurements to ensure proper operation.

1. Types and Uses

In the S.I. metric system of measurement, the unit of length is the metre. In automotive work the most commonly used unit of length is the millimeter, which is one thousandth (1/1000) of a meter. For more precise and smaller measurements the millimeter is divided into tenths and hundredths.

Because accurate measurement is often essential, it is necessary to learn to use the various measuring tools efficiently.

The simplest tool for measuring is the graduated rule which, for automotive work, is made of alloy steel, hardened and ground.

2. Care and Storage

A measuring instrument is a delicate precision instrument and must be treated accordingly. To maintain consistent results and the accuracy of the instruments, the following points should be observed.

-before using the instrument, clean the faces.

-check the zero setting before starting the measurement.

-switch off electrical meters when not in use and keep them away from heat and moisture.

-clean and steady the work piece or component being measured.

（1）When they are not in use, place them back in their box or plastic wallet.

（2）Store them in a safe place. For example, in a cupboard drawer, on a shelf or in a safe area on the workbench.

（3）Before putting them away, clean the instruments and where necessary lightly oil the



moving parts.

（4）Storing instruments in such a manner as will ensure that they are safe from dust, corrosion and accidental damage.

3．Types and Uses——Electrical

Test instruments

Many of the component operations on a vehicle are physical. The method of operation is visible and can be readily understood. When considering electrical and electronic systems, the problem becomes more difficult. The effect of electrical current is observable—a starter motor turns or a lamp is illuminated—but electricity cannot be ‘seen’ in the same way as it is possible to observe the flow of oil or fuel.

In order to test electrical circuits and components, a means of measuring the flow rate (current), the flow pressure (voltage) and the resistance to flow (resistance) of electricity is required. The majority of electrical system testing can be achieved by the use of a voltmeter, an ammeter and an ohmmeter. The instruments can be analogue (moving pointer on a printed scale) or digital (numbers appearing on a liquid crystal display). Selection of a test instrument should be based on the type of work it will be used to test. Relatively cheap moving coil meters are adequate when high current flow is present and/ or voltage reading accuracy is not critical. Extremely accurate moving coil meters are available, but these tend to be expensive. The type of meter gaining popularity amongst mechanics and technicians is the digital multi-meter. These units are robust and many are auto-ranging (eg. not necessary to change scales for accuracy). They are overload protected in some ranges and can be switched to read amps, volts and ohms. The accuracy of these units on a cost basis is superior to analogue meters.

The three forms of electrical circuits are:

（1）Series.

（2）Parallel.

（3）A combination of both, known as series/ parallel.

A working knowledge of these circuits, coupled with an understanding of the definition of the volt, ampere and the ohm will be of invaluable assistance when using instruments for testing.



Practice spoken English.

Miss Li: Hi,Mr.Liu.

Mr. Liu: Hi,Miss Li, how are you?

Miss Li: I am fine.Thank you.But I have some problems with the workplace tools and measuring equipments. Could you give me a favor?

Mr. Liu: Yes, my pleasure. What are these problems?

Miss Li: Can you tell me some of the workplace tools and measuring equipments?

Mr. Liu: Oh ,there are many kinds of workplace tools and measuring equipments in common use, such as seal puller ,steering wheel ,valve tapper, valve seat cutter, valve seat hone…

Miss Li: What are they used for?

Mr. Liu: The seal puller are used for removing oil seals and valve seat cutter are used for restoring valve seats in the combustion chambers of a cylinder head.

Miss Li: Are the…used in mass production?

Mr. Liu: No.

Miss Li: Why?

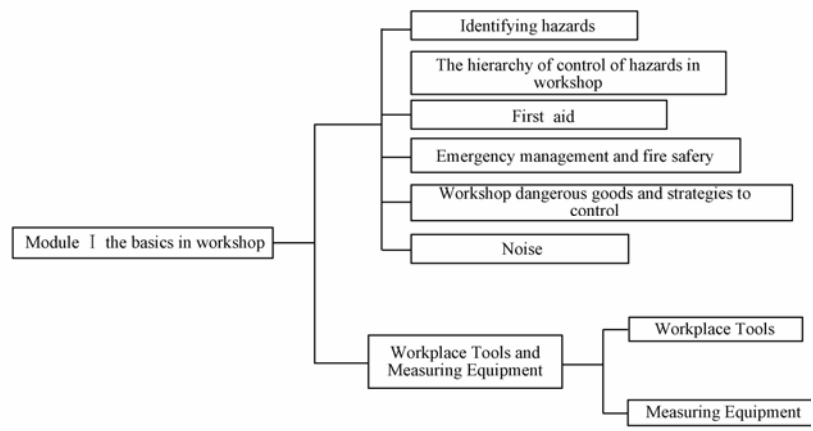
Mr. Liu: Because they are rather…in operation.

Miss Li: I am really appreciated you for telling me these knowledge.

Mr. Liu: I was glad to be of some services.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Self assessments



Time_____ Class_____

No.	Name	Evaluation Items				Notes
		Attitude	Presentation& Passage	Exercises	Activities	

Teachers' Observation Record and Evaluation Sheet

item / level	listening	speaking	reading	writing	familiarity of parts
good					
better					
best					
bad					



Module II

The Foundation of Manufacturing

Guidance on teaching and learning

Teaching	VIP points	Master the foundation of manufacturing
	Teaching methodology	Topic learning ,visual memorizing, group or one-centered learning, note-taking ,teamwork, presentation, questioning
	Nominal periods	16 periods
Learning	Learning methodology	In class: intensive and extensive reading ,sentence translation Out of class: fast writing ,induction, deduction, self-evaluation
	Compulsory theoretic knowledge	Master the terms needed
	Learning procedures	Step 1 read the materials in pairs Step 2 discussion the learning materials with your partners Step 3 check the answers with the help of your group members and teachers Step 4 copy new words and expressions you don't know in this section



Scene One Mechanical Materials

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning.

supervision	n. 氧化物
flexibility	n. 碳酸盐，黑金刚石
sulfide	v. 精炼，提纯
optimum	a. 无穷的 n.无尽
cam	n. 硫化物
metallic	n. 机动性，灵活性
carbonate	n.（复数 optima）最适合条件
refine	n. 车床
commercial	a. 有机的
oxide	a. 金属的
nonmetallic	n. 凸轮
lathe	a. 特有的 n. 特性
infinite	a. 非金属的
organic	n. 监督，管理
characteristic	a. 商业上的，商业的

The following expressions we may use, before we finish off the task please make out their Chinese meaning with the help of your teammates or dictionary or surfing the internet.

special-purpose	differ from…
general-purpose	either… or…
nonferrous metal	not only … but also …
suite to	

The material and the process are understood in the design and manufacture of a product. Materials differ widely in physical properties, machinability characteristics, methods of forming, and possible service life.

Mechanical materials fall into two basic types: metallic or non-metallic. Non-metallic materials are further classified as organic or inorganic substances. We should pay more attention to choose the appropriate material because there is an infinite number of non-metallic materials and pure as well as alloyed metals.

Few commercial materials such as oxides, sulfides, or carbonates, exist as elements in nature. So they must undergo a separating or refining operation before they can be further processed. In metal working, iron is the most important natural element .When combined with other elements into various alloys it becomes the leading engineering metal. The nonferrous metals, including copper, tin, zinc, nickel, magnesium, aluminium, lead, and others all play an important part in our economy.

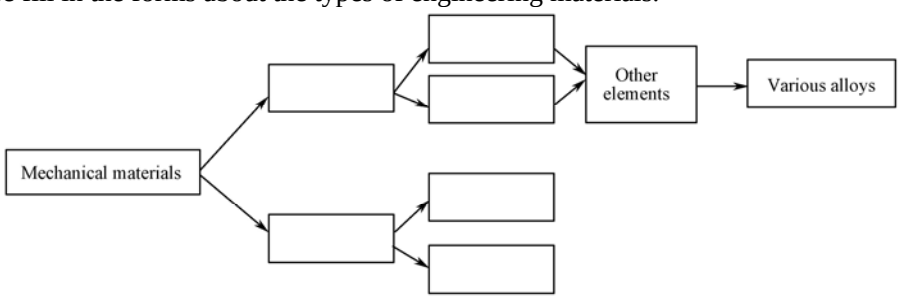
Make a survey about mechanical engineering materials in your workplace.

Task One

List the factors we have to consider the differences among the mechanical engineer materials after discussion with your group members.

Task Two

Please fill in the forms about the types of engineering materials.



Read the above underlined materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）Materials differ widely in physical properties, machinability characteristics, methods of forming, and possible service life.

（2）We should pay more attention to choose the appropriate material because there is an infinite number of non-metallic materials and pure as well as alloyed metals.

（3）Few commercial materials such as oxides, sulfides, or carbonates, exist as elements in nature.

（4）The nonferrous metals, including copper, tin, zinc, nickel, magnesium, aluminium, lead, and others all play an important part in our economy.

 After talking about the materials with your group members and then do your best to answer the following questions according to the above materials.

（1）What facts should the designer consider in selecting an economical material and a process that is best suited to the product?

（2）Which natural compounds of metals do not exist as elements in nature?

（3）Can you list some nonferrous metals according to the above materials?

Manufacturing requires tools and machines that can produce economically and accurately. Economy depends on the proper selection of the machine or process that will give a satisfactory finished product, its optimum operation, and maximum performance of labour and support facilities. In small-lot or job shop manufacturing , general-purpose machines such as the lathe, drill press, and milling machine may prove to be the best because they are adaptable ,have lower initial cost, require less maintenance, and possess the flexibility to meet changing conditions .

A simple bolt may be produced on either a lathe or an automatic screw machine. The lathe operator must not only know how to make the bolt, but also be sufficiently skilled to operate the machine .On the automatic machine the sequence of operations and movements of tools are controlled by cams and stops ,and each item produced is identical with the previous one .Often it is uneconomical to make a machine completely automatic. Because the cost may become prohibitive, most parts can be produced by several methods, but usually there is one way that is most economical.

Factors that must be considered are volume of production, quality of the finished product, and the advantages and limitations of the equipment capable of doing the work .Most parts can be produced by several methods, but usually there is one way that is most economical.

 Reading the above information with the help of your classmates, try to understand the meaning of it and then fill in the blanks in the following short paragraph.

We should pay attention to two elements such as _____ and _____, when considering tools and machines in manufacturing.

We must think of these factors if we have to manufacture economically, they are the _____ of a machine and the process which produce the products , its _____ operation, and _____ performance of labour and _____.

 Discuss with your colleagues and try to share the ideas of your partners and then make



sure which of the following expression is right or wrong. Right for T and wrong for F.

（　　）General-purpose machines may prove to be the best in small-lot or job shop manufacturing .

（　　）Lathe, drill press, and milling machine may meet changing conditions since they are adaptable ,have lower initial cost ,require less maintenance, and possess the flexibility too .

（　　）To operate the machine ,the lathe operator must know both how to make the bolt and be sufficiently skilled.

Survey your factory attached to your college and make it clear that why it is uneconomical to make a machine completely automatic, talking about it in your group.

Read the last paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）When considering economic factors what kind of elements we should pay more attention to?

（2）Why lathe, drill press, and milling machine may prove to be the best that can produce economically and accurately?

Read the above underlined materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）On the automatic machine the sequence of operations and movements of tools are controlled by cams and stops, and each item produced is identical with the previous one.

（2）Most parts can be produced by several methods, but usually there is one way that is most economical.

Practice spoken English.

Mr. Liu: Good afternoon, Mr. Xie.
Mr. Xie: Good afternoon, Mr. Li
Mr. Liu: May I ask you a few questions?
Mr. Xie: Yes, of course. What are the problems?
Mr. Liu: How many kinds of mechanical materials are there in common use?
Mr. Xie: There are many kinds of gears.
Mr. Liu: What are they?
Mr. Xie: They are …

Mr. Liu: Are mechanical materials important in nearly all of machinery?
Mr. Xiu: Yes, they are.
Mr. Liu: What can the mechanical materials be used for?
Mr. Xiu: …
Mr. Liu: How do you distinguish the mechanical materials?
Mr. Xie: …
Mr. Liu: Thank you for telling me about these.
Mr. Xie: Not at all.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Two Kinds of Steels

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning.

manganese	钨
molybdenum	锰
nickel	铬
tungsten	镍
chromium	钼
corrosion	轴承
bearing	轴
shaft	齿轮
vanadium	介质
medium	螺栓，螺钉
bolt	钒
harden	淬火
gear	中间的
grain	晶粒
tool steel	腐蚀
stainless	不锈钢



The following expressions we may use , before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

工具钢	自硬钢
耐热的	耐热钢

There are two general kinds of steels: carbon steel and alloy. Carbon steel contains only iron and carbon, while alloy steel contains some other “alloying elements” such as nickel, chromium, manganese, molybdenum, tungsten, vanadium, etc.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）How many kinds of steels are there?

（2）Can you give a definition to carbon steel?

（3）Can you tell the differences between carbon steel and alloy steel?

Work with your group members and read the above information again, please tick out which of the following belong to alloying elements.

nickel	（ ）	chromium	（ ）	manganese	（ ）
molybdenum	（ ）	tungsten	（ ）	vanadium	（ ）

Carbon steels

（1）Low carbon steel containing from 0.05 to 0.15 percent carbon; this steel is also known as machine steel.

（2）Medium carbon steel containing from 0.15 to 0.60 percent carbon.

（3）High carbon steel containing from 0.60 to 1.50 percent carbon; this steel is sometimes called “tool steel”.

Carbon steels are the most common steels used in industry. The properties of these steels depend only on the percentage of carbon they contain. Low carbon steels are very soft and can be used for bolts and for machine parts that do not need strength.

Medium carbon steels are a better grade and stronger than low carbon steels. It is also more difficult to cut than low carbon steels.

High carbon steels may be hardened by heating it to a certain temperature and then quickly cooling in water. The more carbon the steels contain and the quicker the cooling is, the harder it

becomes. Because of its high strength and hardness this grade of steel may be used for tools and working parts of machines.

But for some special uses, for example, for gears, bearings, springs, shafts and wire, carbon steels cannot be always used because they have no properties needed for these parts.

What is carbon steels?

- Carbon steels are those steels which only contain iron and carbon, small amounts of other alloying elements. The three principal types of carbon steels used for die and mold parts are :
- _____ containing 0.05% and 0.3% carbon.
- _____ containing 0.3% and 0.7% carbon.
- _____ containing 0.7% and 1.5% carbon.

As the carbon content is increased in carbon steel, the strength, toughness, and hardness also_____ when the metal is _____ treated.

Low carbon steels are soft, tough steels that are easily machined and welded, so these steels can't be hardened except by hardening. They are suited for the following applications: unimportant die and mold parts, upper and lower shoes, and similar situations where strength and wear resistance are not required.

Make a survey about low carbon in your workplace.

Examine your own workplace, and make out low carbon materials.

Medium carbon can be heat-treated to make pares such as studs, plus, axles, and nuts .Therefore they are more expensive as well as more difficult to machine and weld than low carbon steels.

High carbon steels are used frequently for parts where wear resistance is an important factor. They're used as guide pin bushings, guide pins, punch, and wear pads.

Examine your own workplace, and make a comparison among the three kinds of steels.

Items / Types	contents of carbon	characteristics	applied parts	more
low carbon				
medium carbon				
high carbon				

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

Low carbon steel is also known as _____, "tool steel" is sometimes called



_____, _____ are the most common steels used in industry. The properties of these steels depend only on the_____ of carbon they contain.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What kind of steels can be used for bolts and machine parts?

（2）How carbon steels may be hardened?

（3）What kind of machine parts can't be produced by carbon steel?

Steels with additional elements to change the mechanical properties are alloyed metal. The added elements mostly are manganese, nickel, molybdenum and chromium. They have the general name: manganese steel, nickel steel, molybdenum steel and chromium steel. Stainless steel is a term used to describe high chromium and nickel-chromium steels. These steels are used for molds which must resist high temperatures and corrosive atmospheres. Some high chromium steels can be hardened by heat treatment and are used where resistance to wear, abrasion, and corrosion are required .Typical applications are plastic injection molds.

Discuss with your colleagues and try to share the ideas with your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）Alloy steels contain the same content as carbon steels. （ ）

（2）Alloy steels contain elements such as chromium, molybdenum and vanadium. （ ）

（3）The essential constituents in both carbon and alloy steels are ferrite and carbon. （ ）

Make a survey about alloy steels in your workplace.

Alloy steels

（1）Special alloy steel, such as nickel, chromium steel;

（2）High-speed steel also known as self-hardening steel.

Some special alloy steels should be used for such parts because the alloying elements make them tougher, stronger, or harder than carbon steels. Some alloying elements cause steel to resist corrosion, and such steels are called stainless steels. Stainless steels contain a high percentage of chromium. Chromium also makes steel harder. Nickel is used in steel to increase strength and

toughness .Some alloying elements (such as chromium and tungsten) make the grain of steel finer thus increasing the hardness and strength of steel, because the tuber the grain is, the stronger the steel becomes.

Heat-resistant steel is made by adding some tungsten and molybdenum, while manganese increases the wear resistance of steel. Vanadium steels resist corrosion and can stand shocks and vibration.

Tools made of high-speed steel containing tungsten, chromium, vanadium, and carbon, may do the work at much higher speeds than carbon tool steels.

 Work with your workmates in the workplace and observe carefully, asking the master for help if there is any question, then finish off the following exercises with your teammates.

 Write out the definition of alloy steels with your group members.

 Look at the above materials again and talk with your classmates and finish off the following tasks. Compare the differences between carbon steels and alloy steels.

	carbon steels	alloy steels
components		
advantages		
disadvantages		

 Write out the function of alloying elements.

 Work with your classmates and read the above materials again and then tick out which of the following items are belong to alloying elements, tick it out if it is.

nickel	()	chromium	()	tungsten	()
molybdenum	()	manganese	()	vanadium	()
carbon	()				

 Look at the following phrases carefully with your partners and then try to translate them into Chinese, and finally dictate them for each other among your group members.





alloy steel	nickel	chromium steel	high-speed steel	self-hardening steel
()	()	()	()	()
alloying elements	carbon tool steels	stainless steels	heat-resistant steel	vanadium steels
()	()	()	()	()

Practice spoken English.

Mr. Zhang: Hello, Mr. Cheng, what are you doing?
Mr. Cheng: I am doing some exercises .
Mr. Zhang: What are they?
Mr. Cheng: It is about the kinds of steels.
Mr. Zhang: Do you know the kinds of steels?
Mr. Cheng: Yes, they are …
Mr. Zhang: Is it important in machining?
Mr. Cheng: Yes.
Mr. Zhang: Why?
Mr. Cheng: …
Mr. Zhang: Thank you for your help.
Mr. Cheng: My pleasure.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.



Scene Three　Plastics

Listen and fill in the following blanks.

Plastic means _____or impressionable. It is defined as the capability of being _____ continuously in any _____ without breaking apart. Following this definition, plastics could include glass, metals, and wax. Thus, it is evident that name plastic is misleading and not exactly _____. Today, however, the name plastic is identified with the products which are derived from _____. The synthetic resins are made by various chemical processes. Plastics manufacturing is of comparatively recent date.

Discuss with your team-mates about the definition of plastics?

Read the following materials and think over the tasks after the passage.

Plastics or polymers, commonly called plastics, fall into two broad classes:

● Thermoplastic molding materials. These include polymers such as ABS and polycarbonate used for toys, consumers electronic products, and more flexible kitchenware products. The key feature is that these plastics can be heated to a viscous fluid, molded, and cooled in a reversible, time-and-time-again manner.

Because that the thermoplastic materials are those which soften with heating and solidify and harden with cooling, they can be remelted and solidified and hardened with chemical change.

● Thermosetting molding materials: These include the melamine-formaldehyde used in hard plastic tableware and the epoxy resins used for glues and rein-forced cast products such as kayaks and tennis racket frames. Thermosetting products are heated until they become a viscous liquid, poured or injected into a mold, and then allowed to solidify.

As thermosetting material, chemical cross-linking occurs to create an irreversible, infusible mass. Upon the application of initial heat the thermosetting plastics soften and melt, and under pressure they will fill every crevice of a mold cavity, upon continued application of heat they polymerize, or undergo a chemical change, which hardens them into a permanently hard, infusible, and insoluble state. After this they cannot be softened or melted by further heating.

Summarize the two broad classes of polymers with your partners.

Compare and contrast the similarities and differences between the two kinds of polymers.

Survey the workplace and try to identify the parts that are falling into which kinds of categories.

Which of the following can be used for filler of plastics? And the functions that are applied? Tick the relevant answer if it is.

() wood flour	() cotton frock	() cotton linters	() cotton cloth
() asbestos fiber	() mica	() glass fibers	() silicon
() cellulose	() clay	() nutshell flour	() dyes
() pigments	() lubricants	() accelerators	() plasticizers

Do you know the characteristics of forming and shaping processes for plastics and composite materials?



Please look through the following table carefully and try to know the meaning of the terms, then remember by your heart and dictate for each other, finally copy them down on your assessment sheet.

Process	Characteristics
Extrusion	Long, uniform, solid or hollow complex cross-sections; high production rates; low tooling costs; wide tolerances
Injection molding	Complex shape of various sizes, eliminating assembly; high production rates; costly tooling; good dimensional accuracy
Structural foam molding	Large parts with high stiffness-to-weight ratio; less expensive tooling than in injection molding; low production rates
Blow molding	Hollow thin-walled parts of various sizes; high production rates and low cost for making containers
Rotational molding	Large hollow shapes of relatively simple shape; low tooling cost; low production rates
Thermoforming	Shallow or relatively deep cavities; low tooling costs; medium production rates
Compression molding	Parts similar to impression-die forging; relatively inexpensive tooling; medium production rates
Transfer molding	More complex parts than compression molding and higher production rates; some scrap loss; medium tooling cost
Casting	Simple or intricate shapes made with flexible molds; low production rates
Processing of composite materials	Long cycle times; tolerances and tooling cost depend on process

Practice spoken English.

Mr. Li: Excuse me,may I ask you a question?Bob.
Bob: Of course.
Mr. Li: Do you know about the plastic?
Bob: Yes.I know some of them.
Mr. Li: Is plastic important in manufacture industry?
Bob: Plastic is the foundation of machine.
Mr. Li: What's this then?
Bob: It's …
Mr. Li: What's that?
Bob: …
Mr. Li: What's that then?
Bob: Do you know more information?
Mr. Li: Yes.You are very kind.
Bob: Delighted to have been of assistance.

New words and expressions we learn（let the students copy the new words and expressions he

or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Four Hot Working and Heat Treatment

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

molecular	a. 分子的
bending	n. 磨削加工
bend	a. 机械加工的
pressure	n. 压力，压强
machined	n. 弯曲（度），扭曲（度）
grinding	v. 弯曲
mechanical	a. 机械的
machining	n. 切削加工
relieve	v. 释放，消除
liable	v. 上升
contract	v. 收缩，缩紧
rise	n. 成形，造型
shaping	a. 易于……的，可能的
bend	v. 挤（压，干），压榨
prior	v. 弯曲
squeeze	a. 在先的，居先的
bending	n. 弯曲（度），扭曲（度）
fix	n. 回火
tempering	n. 薄板卷，泛指钢材
rolls	v.& n. 固定，确定
recrystallization	n. 再结晶
influence	n. 影响，作用
annealing	n.（低温）退火，焖火
shaping	v.上升
contract	a. 分子的
rise	v. 收缩，缩紧



relieve	a. 易于……的，可能的
liable	n.（低温）退火，焖火
molecular	v. 释放，消除
annealing	n. 成形，造型
mechanical	n. 磨削加工
machining	n. 切削加工
grinding	a. 机械的
machined	a. 机械加工的
pressure	n. 压力，压强
distortion	v.& n. 破裂，裂纹
crack	v.& n. 淬火，淬硬
beyond	n. 变形，扭曲
quench	prep. 超过……的范围
draw	v. 剪断，切断
drawing	n. 冲压成形
shear	v. 拉，拔
hardening	n. 硬化，淬火
crystalline	a. 结晶的　n. 结晶体

The following expressions we may use , before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

机械设备（工具）　　……称为……

淬火温度区

We can heat the steel above a certain critical temperature, and then allow it to cool at different rates. In the process known as annealing we heat the steel above the critical temperature and permit it to cool very slowly. This cause the metal to become softer than before, and much easier to machine. Annealing has a second advantage, it helps to relieve any internal stresses .These stresses are liable to occur through hammering or working the metal, or through rapid cooling. This produces unequal contractions, which may give rise to distortion or cracking.

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

We can alter the characteristics of steel by _____ it up to a certain temperature and then _____ it at different rates. This process may be called _____ .The _____ are liable to happen during _____, or _____, or _____, which may give rise to _____ and _____.

Observe your workplace and try to understand this phenomenon with your teammates if any questions, ask the master for help.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is the definition of annealing?

（2）What's the purpose of annealing?

（3）What are the advantages of annealing?

（4）What hammering or working the metal or rapid cooling may result in?

We can make steel harder by rapid cooling. We heat it up beyond the critical temperature, and then quench it in water or some other liquid. But a bar of this hardened steel is more liable to fracture than normal steel. We therefore heat it again to a temperature below the critical temperature, and cool it slowly. This treatment is called tempering. It helps to relieve the internal stresses, and makes the steel less brittle than before.

The properties of tempered steel enable us to use it in the manufacture of tools, High carbon steel is harder than tempered steel, but it is much more difficult to work. These heat treatments take place during the various shaping operations. Cold rolling enables the operators to produce rolls of great accuracy and uniformity, and with a better surface finish. Other shaping operations include drawing into wire, casting in moulds, and forging.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）We can make steel harder by heating it up beyond the critical temperature, and then quench it in water or some other liquid. （ ）

（2）We heat the steel above the critical temperature and permit it to cool very slowly is known as annealing. （ ）

（3）Heating the steel again to a temperature below the critical temperature, and cool it slowly is called tempering. （ ）

（4）Both annealing and tempering can relieve internal stresses. （ ）


Look at the above information again with your colleagues and then practice in your workplace, try to make clear the following questions.

（1）Compare the differences between high carbon steel and tempered steel.

High carbon steel	tempered steel

（2）Please list the advantages of cold rolling.

（3）If the following items need shaping operation, please tick it out with the help of your roommates.

drawing into wire （ ） casting in moulds （ ）

forging （ ）


The mechanical working of metal is the shaping of metal in either a cold or a hot state by some mechanical means. This does not include the shaping of metals by machining or grinding, in which processes, the metal is shaped by pressure-acutely forging, bending, squeezing, drawing, or shearing it to its final shape.

Although normal room temperatures are ordinarily used for cold working of steel, temperatures up to the recrystallization range are sometimes used. Hot working of metals takes place above the recrystallization or work-hardening range.

Some metals, such as lead and tin, have a low recrystallize range and can be hot-worked at room temperature, but most commercial metals require some heating.


Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）How do machining or grinding make the metal to its final shape?

（2）Can room temperatures be ordinarily used for cold working of steel?

（3）What kind of situation can hot working of metals take place?

（4）Is any metal can be hot-worked at room temperature?


The combination of heating and controlled cooling determines not only the nature and distribution of the micro constituents, which in turn determine the properties, but also the grain size.

What are the various purposes of heat treating?

（1）To remove strains after cold working such as forging, rolling.

（2）To remove internal stress such as produced by drawing, bending, extruding or welding.

（3）To increase the hardness of the material and wear-resisting properties.

（4）To improve machinability.

（5）To improve the comprehensive performance of material on purpose, such as normalizing.

（6）To soften the material, as in annealing.

（7）To improve or change properties of a material such as corrosion resistance, heat resistance, or others as required.

Find out the types of heat treatment in your workplace with your teammates.

Fill in the blank with the corresponding answer to the definition.

A. annealing B. normalizing C. tempering D. hardening E. case hardening
F. spheroiding G. stress relieving H. surface treatments

（ ）（1）Heating the steel to an elevated temperature for a definite period of time and, usually, cooling it slowly.

（ ）（2）Producing homogenization and to establish normal equilibrium conditions, with corresponding characteristic properties.

（ ）（3）The steel is heated slightly above its critical range and then cooled very slowly.

（ ）（4）Heating the material to a temperature of about 55～100℃ about the critical range and cooling in still air.

（ ）（5）The purpose is to refine grain structures that have been coarsened in forging.

（ ）（6）Most of the medium-carbon forging steels, alloy, normalizing is highly recommended after forging and before machining to produce more homogeneous structure and improved machinability.

（ ）（7）The process of heating quenched and hardened steels and alloys to some temperature below the lower critical temperature to reduce internal stressed setup in hardening.

（ ）（8）The process of heating to a temperature above the critical range, and cooling rapidly enough through the critical range to reduce to appreciably harden the steel.

（ ）（9）The process may involve the use of molten sodium cyanide mixtures; pack carburizing with activated solid material such as charcoal or coke, gas or oil carburizing, and dry cyaniding.

（ ）（10）The process of heating and cooling steel produces a rounded or globular form of carbide——the hard constituent in steel.

（ ）（11）It is the simplest heat treatment and is accomplished merely by heating to 649～732℃ followed by air or furnace cooling.



（　）（12）It is applied in the die casting industry to steels to improve the properties of nozzle, ejector pins, and cores and shot sleeves, to provide maximum resistance to erosion, pitting and soldering.

 The students will work in groups draw a tree of the knowledge in this unit.

 Practice spoken English.

Miss Li: Hi,Mr.Liu.

Mr.Liu: Hi,Miss Li, how are you?

Miss Li: I am fine, thank you, but I have some problem with hot working and heat treatment. Could you give me a favour?

Mr.Liu: Yes, my pleasure. What are these problems?

Miss Li: I don't know how they works?

Mr.Liu: So you can look at the reference book in the library .

Miss Li: Do you know heat treatment?

Mr.Liu: …

Miss Li: Is hot working used in mass production?

Mr.Liu: Yes.

Miss Li: Why?

Mr.Liu: Because …

Miss Li: But ,for mass production,what other methods should we use?

Mr.Liu: …

Miss Li: I am really appreciated you for telling me these knowledge.

Mr.Liu: I am glad to be of some services.

 New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.



Scene Five　Tolerances and Fits

 Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

terminology	规定，规范
interchange	交换
specification	总成，组件
mate	配对物，配合，配成对
assembly	术语
plus	正的，正量
minus	负的，减去的

The following expressions we may use , before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

符号，标志	名义上的	理论的
双向的	单向的	相对于，关于

Although standardized measurement is essential to modern industry, perhaps even more important are the design specifications that indicate the dimensions of a part. These dimensions control the size of a part, its features, and/or their location on the part or relative to other parts. Through this, parts are able to be interchanged and mated to each other to form complete assemblies. The purpose of this scene is to introduce the basic terminology of tolerances and fit.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is even more important to modern industry?

（2）Why these dimensions are more important?

（3）What is the purpose of the design specifications?

Work with your group members and read the above information again and try your best to solve the following problems.

Please think over the above information again and then write down a piece of paper as the answer sheet for your group.



Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

Although standardized measurement is essential to _____ industry, perhaps even more important are the _____ that indicate the dimensions of a part. These dimensions control the _____ of a part, its _____, and/or their _____ on the part or relative to other parts. Through this, parts are able to be _____ and _____ to each other to form complete assemblies. The purpose of this scene is to introduce the basic terminology of _____ and _____.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）Perhaps design specifications are even more important to modern industry.

（2）These dimensions control the size of a part, its features, and/or their location on the part or relative to other parts.

（3）Parts are able to be interchanged and mated to each other to form complete assemblies.

Please read the above materials again and then try to tick out which of the following items are involved in the design specifications after discussing with your classmates.

size of a part （ ） location on the part （ ）

relative to other parts （ ） features （ ）

Since it is impossible to machine a part to an exact size, a designer must specify an acceptable range of sizes that will still permit the part to fit and function as intended. The maximum and minimum sizes in part dimensions that are acceptable are limits, between which the actual part dimension must fall. The difference between the maximum and minimum limits is tolerance, or the total amount by which a part dimension may vary. Tolerances on drawings are often indicated by specifying a limit, or by plus and minus notations. With plus and minus tolerance, when the tolerance is both above and below the nominal size, it is said to be bilateral. When the tolerance is indicated all on one side of nominal, it is said to be unilateral.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）It is possible to machine a part to an exact size. （ ）

（2）A designer must not decide an acceptable range of sizes which permit the part to fit and function as intended. （ ）

（3）The maximum and minimum sizes in part dimensions that are acceptable are limits. （ ）

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

machine a part	maximum and minimum sizes	limits
tolerance	part dimension	plus and minus notations
bilateral	unilateral	

Work with your teammates and read the above materials again and then look at the following definitions, choose the best terms filling the correspondence parenthesizes.

tolerance limits bilateral unilateral

（1）The acceptable size between the maximum and minimum in part dimensions. （ ）

（2）The difference between the maximum and minimum limits. （ ）

（3）When the tolerance is both above and below the nominal size. （ ）

（4）When the tolerance is indicated all on one side of nominal. （ ）

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Then write down the meaning of the following figures. Give a topic to the following figure. Dictate the new words for each other among your group members.

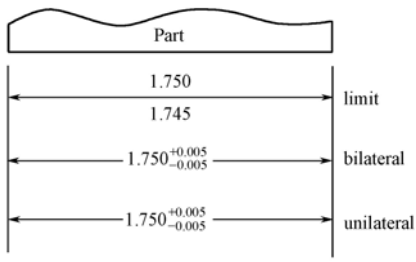


Figure 3-6_____

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.



Look at the following words we may use in this scene and try to make out their Chinese meaning in a given time, whoever finishes off it first will be the winner.

vitally　　machinist　　overlap　　interference　　frictional

Now look at the following Chinese meaning with your colleagues carefully and try your best to make out their English meaning, finally dictate them for each other among your team workers.

零件　　尺寸再生　　珩磨　　试图，企图　　过盈配合，压配合

When two parts are interchanged in an assembly, tolerance becomes vitally important. The shaft must fit the bearing and be able to turn freely. The diameter of the shaft is specified as 1.000 ±0.001.This means that the maximum limit of the shaft is 1.001 and the minimum is 0.999.The tolerance is then 0.002 and bilateral.

The maximum limit of the bearing bore is also 1.001 and the minimum limit is 0.999.The tolerance is once again 0.002.Will the shaft made by one machine shop fit the bearing made by another machine shop using the tolerances? If the shaft is turned to the maximum limit of 1.001 and the bearing is bored to its minimum limit of 0.999, both parts would be within acceptable tolerance, but would not fit to each other since the shaft is 0.002 larger than the bearing. However, if the bearing bore was specified in limit form or unilateral tolerance of 1.002±0.002, the parts would fit as intended. Even if the shaft was turned to the high limit of 1.001, it would fit the bearing even though the bore was machined to the low limit of 1.002. Although machinist is not usually concerned with establishing tolerance and limit specifications, you can easily see how fit problems can be created by overlapping tolerances.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）When two parts are interchanged, what becomes vitally important?

（2）When the tolerances both the shaft made by one machine shop and the bearing made by another machine shop are the same, do they fit each other?

Survey your workplace and observe carefully, make out the importance of tolerances and fit and then ask the master for help if any problems, write down your experiences in your workplace.

Work with your teammates and read the above materials again and then do your best to

solve the following problems.

（1）Supposing the diameter of the shaft is specified as 30.125±0.001 in bilateral tolerance, What is the maximum limit? And what is the minimum limit? What is the tolerance?

（2）If the bearing bore was specified in unilateral tolerance of 50.009±0.012, what would be the minimum limit? What would be the maximum limit? What is the tolerance?

（3）Supposing the diameter of the shaft is specified as 30.125±0.001 in bilateral tolerance, what would be the minimum and maximum limit of the bearing bore? If the diameter of the bearing bore is 30.125±0.001 in bilateral tolerance, Can it possible? How about the diameter of the bearing bore is 30.125±0.002 in unilateral tolerance?

（4）Supposing the diameter of the bearing bore is 30.125±0.001 in unilateral tolerance, what would be the minimum limit? What would be the maximum limit? What is the tolerance?

Observe your workplace and try to understand this phenomenon of fits with your teammates, if any questions, ask the master for help. Look at the following figures, discuss with your classmates and then write down why overlapping tolerances can create fit problems.

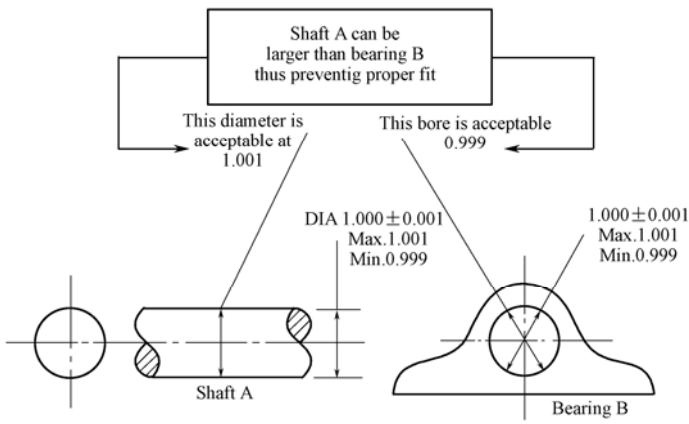


Figure 3-7 Tolerance overlop can prevent proper fit of mating parts

Fit refers to the amount or lack of clearance between two mating parts. Fits can range form free running or sliding, where a certain amount of clearance exists between mating parts, to press or interference fits where parts are forced together under pressure. Clearances fits can range form a few millionths of an inch, such as would be the component parts of a ball or roller bearing, to a clearance of several thousands of an inch for a very low speed drive or control lever application.

Many times a machinist is concerned with press or interference fits. In this case two parts are forced together usually by mechanical or hydraulic pressing. The frictional forces involved then hold the parts together without any additional hardware such as keys or setscrews. Tolerances for press fits can become very critical because parts can be easily damaged by attempting to press fit them if there is an excessive difference in their mating dimensions. In addition, press fitting physically deforms the parts some extent. This can result in damage, mechanical binding, or require a secondary resizing operation such as hand reaming or honing after the parts are pressed together.



Work with your workmates reading the above materials carefully and then try to understand tolerances. Please cooperate with your partners and then tick out the corresponding responses for each definition.

fit　　clearance fit　　press fits

（1）free running or sliding exists between mating parts.　　（　　）

（2）the amount or lack of clearance between two mating parts.　　（　　）

（3）parts are forced together under pressure.　　（　　）



Work with your workmates reading the above materials carefully and then try to understand fit. Please cooperate with your partners and then solve the following problems

	clearance fits	interference fits
range		
method		
bad aspects		



Read through the above materials again with your workmates and try to fill in the blanks in the following short passage.

Many times a machinist is concerned with press or _____fits. In this case two parts are forced together usually by _____ or _____ pressing. The frictional forces involved then hold the parts together without any additional hardware such as keys or setscrews. Tolerances for _____ fits can become very critical because parts can be easily _____ by attempting to press fit them if there is an excessive difference in their mating dimensions. In addition , press fitting physically _____ the parts some extent. This can result in damage, mechanical binding, or require a secondary resizing operation such as hand _____ or _____ after the parts are pressed together.



Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

fit	clearance	range
running or sliding	press	ball
roller bearing	machinist	hydraulic pressing
frictional forces	keys	setscrews
deforms	mechanical binding	hand reaming
honing		

Observe your workplace and try to understand this phenomenon of fits with your teammates, if any questions, ask the master for help. Look at the following figures, discuss with your classmates about the two system of fit.

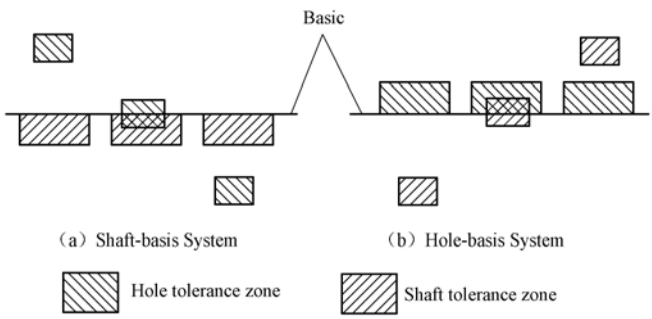


Figure 3-8 The Two Systems of Fit According to ISO

Practice spoken English.

Mr.Zhang: Good morning,Mr Cheng.

Mr.Cheng: Good morning,Mr Zhang.

Mr.Zhang: What are you doing?

Mr.Cheng: I am machining a work-piece.

Mr.Zhang: What's this?

Mr.Cheng: It is a fixture.

Mr.Zhang: What can it do?

Mr.Cheng: We can use it to locate and hold the work-piece when it is machined.

Mr.Zhang: Is the fixture only be used to machine?

Mr.Cheng: No. In fact there are many kinds of fixture and they can also be used for inspection,welding and assembly.

Mr.Zhang: What are its advantages?

Mr.Cheng: We can improve the product precision and reduce time assumption of locating the work-piece.

Mr.Zhang: It's very kind of you for telling me about these.

Mr.Cheng: That's all right.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Six　Machine Design, The Design of Jigs and Fixtures

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

derive	运动学
kinematics	合并，混合
incorporate	动力学
devise	得自，起源
dynamics	设计，发明
innovative	分析，分解
analyze	想象，预想
envision	创新的，革新的
fundamental	极度的，最远的
equation	相等，方程式，等式
misplace	基本原则，基本原理
utmost	十进的，小数的
decimal	放错地方
decimal point	机械制图
mechanical drawing	小数点

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

jig	inspection	gauge	instrument
fixture	designer	approach	characteristic
alter	possibility	advisability	
特性，特征	量规	工具,器械	设计师
改变	夹具	检查	接近，确定
钻磨	可能性	明智	

Machine design is a vast field of engineering technology which not only concerns itself with

the original conception of the product in terms of its size, shape and construction details, but also considers the various factors involved in the manufacture, marketing and use of the product.

A design engineer must also have a solid background in the areas of mechanical drawing, kinematics, dynamics engineering, strength of materials and manufacturing processes.

Machine design should be considered to be an opportunity to use innovative talents to envision a design of a product, to analyze the system and then make sound judgments on how the product is to be manufactured. It is important to understand the fundamentals of engineering rather than memorize mere facts and equations.

Any calculations must be done with the utmost care and precision. A decimal point is misplaced; another wise acceptable design may be no function.

 Work in groups and read through the above materials carefully with your group members and then finish off the following exercises.

（1）Which of the following item is involved in machine design, if it does, please tick it out.

engineering technology	（ ）	size	（ ）	shape	（ ）
construction details	（ ）	marketing	（ ）	use of the product	（ ）

（2）If you want to be a design engineer, you should have which of the following knowledge, please tick it out.

mechanical drawing	（ ）	manufacturing	（ ）
kinematics	（ ）	processes	（ ）
dynamics engineering	（ ）	strength of materials	（ ）

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

What should be considered in machine design according to the last two paragraphs in the above short passage?

 Look at the following words we may use in this scene and match the English and Chinese meaning.

advisability	明智
possibility	可能性
designer	改变
alter	特性，特征
characteristic	接近，确定
approach	设计师
instrument	工具，器械
gauge	量规



inspection	检查
fixture	夹具
jig	钻磨

The following expressions we may use , before we finish off the task, please make out their Chinese meaning with the help of your teammates or dictionary or the internet.

classified as	critical dimension	physical property
locating and holding	gauge block	raw material

Look at the following material carefully and then work with your workmates, do your best to solve the questions after the short passage.

Holding devices may be classified as jigs or fixtures. A fixture is a work-piece locating and holding device used with machine tools, inspection, welding and assembly. It does not control the position of the tool or instrument which is being used. Gauge blocks may be provided for setting the depth or position of the cutting tool in many instances.

The designer first becomes fully aware of all critical dimensions and surfaces. He should also know the part fits into the main assembly if possible. He collects the data such as type of material, physical properties, weight, and the characteristics of the raw material. Other information which could affect the type of fixture to be built is the production quantities, lot sizes, etc.

The designer determines whether fixtures already in the plant can be altered and used for his job. He must also consider the possibility and advisability of using standard holding devices such as vises, parallels and clamps.

Finally the newly designed fixtures must combines as many operations into one fixture as possible.

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

Holding devices may be classified as _____ or _____. A fixture is a work-piece _____ and _____ device used with machine tools, inspection, welding and assembly. It does not control the _____of the tool or instrument which is being used. Gauge blocks may be provided for setting the _____ or _____ of the cutting tool in many instances.

Observe your workplace and try to understand the process of designing jigs and fixtures, read the above materials again and write down the process.

Discuss with your colleagues and try to share the ideas of your partners and then make

sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）The designer want to use existed fixtures to design new ones. （ ）

（2）The design must consider the using of standard holding devices such as vises, parallels and clamps. （ ）

（3）The newly designed fixtures must be considered to be used in as many operations as possible. （ ）

（4）The designer first becomes fully aware of all critical dimensions and surfaces. （ ）

（5）A designer can control the position of the tool or instrument which is being used. （ ）

The students will work in groups discussing the process of design a jig or fixture and then exchanging their experiences in workplace.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Then write down the meaning of the following figures. Give each of the following figures a topic. Dictate the new words for each other among your group members.

Practice spoken English.

John: How do you do! My name is John.

Miss Li: How do you do!

John: Are there any vacancies in your factory?

Miss Li: Yes. We need some new workers. What subject was your major?

John: I majored in mechanical manufacturing, and I think I am good at operating milling machine.

Miss Li: What sort of job do you like to do?

John: I would like to be milling worker. I think I can do my best to be a milling worker.

Miss Li: Great! What time can you start to work?

John: Anytime.

Miss Li: Very nice. How much do you expect in salary?

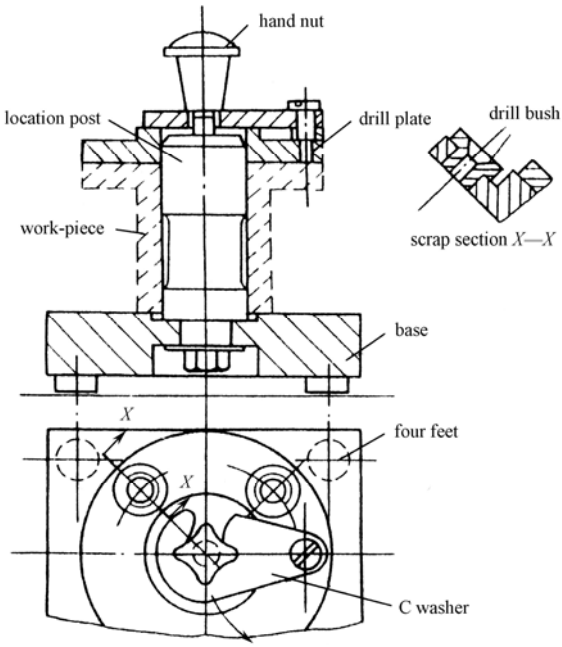
John: 800 Yuan.

Miss Li: OK! Please fill in this form. If anything turns,I'll contact with you.

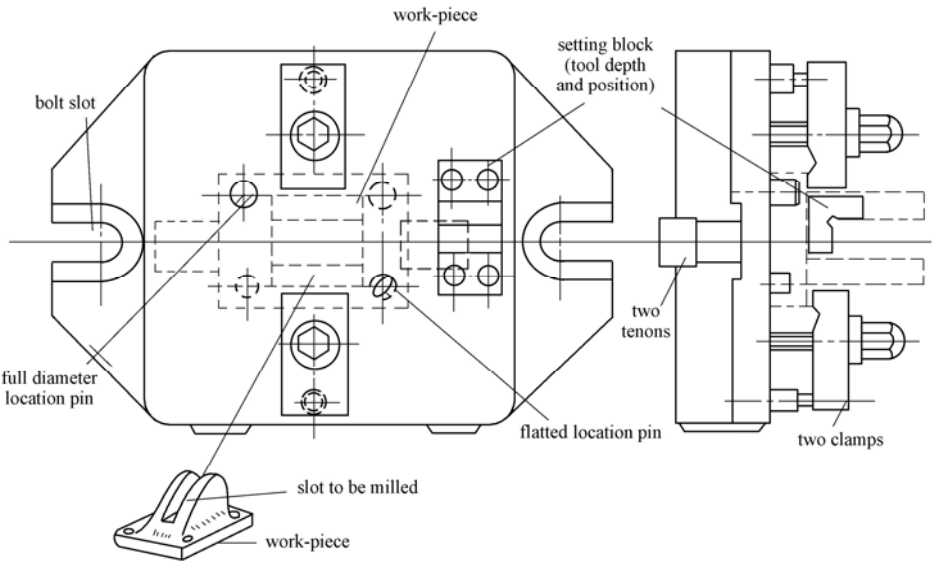
John: Thank you!

Miss Li: You're welcome.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.



（a）_____



（b）_____

Figure 2-1_____



Scene Seven　Primary and Feed Motion



Before you step into this scene, please learn by heart the following words and expressions

with your classmates by looking up the dictionary or surfing the internet.

 Look at the following words we may use in this scene and match the English and Chinese meaning.

continuous	比例，部分
removal	第一位的，初级的
geometry	连续不断地
proceed	连续的，持续的
absorb	移动，切除
broadly	吸收，吸引
primary	宽的
continuously	几何形状，几何学地
broad	概括地，大致
proportion	进行，发生
lateral	横（向）的
motionless	不动的，静止的
linear	返回，退回
return	直线的，线性的
kinematics	相反
principle	相反，背面，倒退
reversely	关系
reverse	原则，原理
relationship	运动学（上）的
advance	圆的
round	轴
axis	前进，推进
axes	轴（复数）
consideration	时间，物质
matter	比较
comparison	机械的
mechanical	考虑

 The following expressions we may use , before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

概括地讲	逐步地
返回行程	对……加以考虑，考虑到
横向进给运动	小部分
线性运动	比较起来



导致　　通常，照例
制造业　　空缺
主运动

Broadly speaking, two kinds of relative motion must be provided by a machine tool——the primary motion and the feed motion. Combination of these two motions will lead to a chip removal and the creation of machined surface with desired geometry. As a rule, the primary motion absorbs most of total power which is required to perform a machining operation. The feed motion may proceed by steps or continuously and absorb a small proportion of the total power.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please compare the differences between primary motion and the feed motion.

	primary motion	feed motion
definition		
power absorption		

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What are the two kinds of relative motion?

（2）What motion absorbs most of total power?

（3）What motion may absorb a small proportion of the total power?

Read through the above information again with your workmates and try to fill in the blanks in the following short passage. Dictate the words and expressions for each other among your roommates.

Two kinds of relative motion must be provided by a machine tool—the _____ motion and the _____ motion. Combination of these _____ motions will lead to a chip removal and the creation of machined surface with desired geometry. As a rule, the primary motion absorbs most of total _____ which is required to perform a machining operation. The feed motion may proceed by steps or continuously and absorb a small proportion of the _____ power.

Read the above materials again with your workmates and then try to translate the following sentences about the primary motion and the feed motion into Chinese, and finally discuss with your workmates.

（1）Two kinds of relative motion must be provided by a machine tool——the primary motion and the feed motion.

（2）Combination of these two motions will lead to a chip removal and the creation of machined surface with desired geometry.

（3）The feed motion may absorb a small proportion of the total power.

Turning means machining a piece of rotating metal by pressing a hardened cutting tool against it. The work is given the primary motion while the tool is fed continuously. The process of planning and shaping is removing metal in a series of straight cuts. In planning, the work is given a linear motion while the tool remains motionless during the cutting stroke and is provided with a lateral feeding movement during the return stroke. In the case of the shaper, the kinematics relationship between work and tool is reversed; however, the cutting action principle is the same. Drilling consists of rotating a cutting tool and advancing the tool along its own axis into a stationary work-piece to produce a round hole. Of the two functions, advancing the tool along its axis is the major consideration in the design of drilling machines. Rotating the drill is, by comparison, a simple matter.

The following expressions we may use, before we finish off the task, please make out their Chinese meaning with the help of your teammates or dictionary or the internet.

turning	primary motion
planning	shaping
straight cuts	linear motion
lateral feeding movement	return stroke
drilling	stationary work-piece
cutting stroke	

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please compare the differences between primary motion and the feed motion.



	primary	feed
definition		
motion		

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please differentiate the following terms.

	turning	planning	shaping	drilling
definition				
work piece motion direction				
tool motion direction				
rotation or linear				

Translate the following sentences about the primary motion and the feed motion with your cooperators.

（1）Turning means machining a piece of rotating metal by pressing a hardened cutting tool against it.

（2）The process of planning and shaping is removing metal in a series of straight cuts.

（3）In planning, the work is given a linear motion while the tool remains motionless during the cutting stroke and is provided with a lateral feeding movement during the return stroke.

（4）Drilling consists of rotating a cutting tool and advancing the tool along its own axis into a stationary work-piece to produce a round hole.

Observe your workplace and try to understand primary and feed motion with your teammates if any questions, ask the master for help. Look at the following figures, discuss with your classmates and then write down the results.

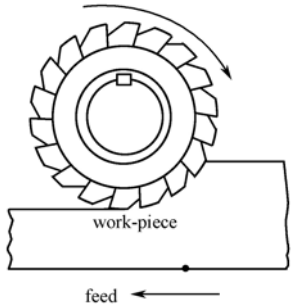


Figure 3-10 Primary motion and feed motion

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the advantages of hydraulic machine tool drive.

（1）The process of planning and shaping means removing metal in a series of straight cuts. （ ）

（2）Turning is removing metal in a series of straight cuts. （ ）

（3）In shaping, the work is given a linear motion while the tool remains motionless during the cutting stroke and is provided with a lateral feeding movement during the return stroke. （ ）

（4）Planning consists of rotating a cutting tool and advancing the tool along its own axis into a stationary work-piece to produce a round hole. （ ）

Survey your workplace and observe carefully, make out the importance of primary and feed motion in your workplace and then ask the master for help if any problems, write down your experiences in your workplace.

Practice spoken English.

Mr.Zhang: Hello,Mr.Chen.

Mr.Chen: Hi,Mr.Zhang.

Mr.Zhang: I have some trouble with the primary motion.Could you like to help me?

Mr.Chen: Yes,I would like to do it.What are these problems?

Mr.Zhang: How can we distinguish the kinds of motion?

Mr.Cheng: We can distinguish them by …

Mr.Zhang: Oh.

Mr.Chen: So primary motion is …

Mr.Zhang: That’s right .

Mr.Chen: And feed motion is …

Mr.Zhang: You are right.

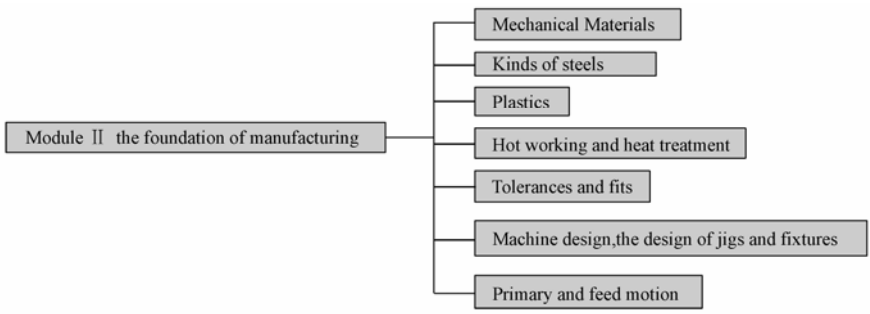
Mr.Chen: So the differences are …

Mr.Zhang: Oh,I see.Thank you for telling me these.

Mr.Chen: You are welcome.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Self assessments



Time_____ Class_____

No.	Name	Evaluation Items				Notes
		Attitude	Presentation& Passage	Exercises	Activities	

Teachers' Observation Record and Evaluation Sheet

item / level	listening	speaking	reading	writing	familiarity of parts
good					
better					
best					
bad					



Module III

Mechanical Elements

Guidance on teaching and learning

Teaching	VIP points	Master the mechanical elements
	Teaching methodology	Topic learning ,visual memorizing, group or one-centered learning, note-taking ,teamwork, presentation, questioning
	Nominal periods	34 periods
Learning	Learning methodology	In class: intensive and extensive reading ,sentence translation, Out of class: fast writing ,induction, deduction, self-evaluation
	Compulsory theoretic knowledge	Master the terms needed
	Learning procedures	Step 1 read the materials in pairs Step 2 discussion the learning materials with your partners Step 3 check the answers with the help of your group members and teachers Step 4 copy new words and expressions you don't know in this section



Scene One　Metal Cutting

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning.

perpendicular	a. 与……垂直 n. 垂直，正交
engage	v. 切入，进入，咬入
stroke	n. 吃刀深度，啮合，衔接，切入
feed	n. 进给量
engagement	n. 打击，冲程，行程，循环，周期
variation	n. 除去，消除
eliminating	a. 棱柱形的，等截面的
deviation	n. 变化，变量，偏差
metal-removal	n. 拉削
forging	v. 使变形　n. 形变，应变
broaching	n. 金刚切削
stain	n. 锻压
milling	n. 铣削
sawing	n. 锯
drilling	n. 钻
fundamental	n. 基本原理
geometry	a. 几何（学，图形）的
geometric	n. 几何图形
workpiece	n. 尺寸，量纲
stock	n. 原料，毛坯
dimension	n. 工件
shaping	n. 形成，成形，成型

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

切削厚度	切削宽度
切削速度	切削深度
受到，经受	直角切削
刀具形状	V 形刀具





Metal cutting can be defined as a process during which the shape and dimensions of a work piece are changed by removing some of the material in the form of chips. The latter are separated from the work piece by means of a cutting tool, which must possess a very high hardness compared with that of the work piece as well as certain geometric characteristics that depend upon the conditions of the cutting operation.

Among all the manufacturing methods, metal cutting is perhaps the most important. Forging and casting are subjected to subsequent machining operations to acquire the precise dimensions and surface finish required. Also, products can sometimes be manufactured by machining stock materials like bars, plates, or structural sections. In fact, machining comprises a group of operations that involve seven basic chip-producing processes, namely shaping, turning, milling, drilling, sawing, broaching, and grinding.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is the definition of metal cutting?

（2）What is the cutting tool must possess? Why?

（3）What are the most important manufacturing methods?

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

1．Tick the correct response in the relevant box.

（1）Seven basic chip-producing processes are shaping, turning, milling, drilling, sawing, forging and casting. （ ）

（2）Products can sometimes be manufactured bars, plates. （ ）

（3）Precise dimensions and surface finish can be required by forging and casting . （ ）

2．Tick out which of the following items are belong to basic chip-producing processes after reading the above materials and discussing with your workmates.

turning	（ ）	surface finish	（ ）
structural sections	（ ）	casting	（ ）
shaping	（ ）	drilling	（ ）
broaching	（ ）	milling	（ ）
forging	（ ）	grinding	（ ）
metal cutting	（ ）	plates	（ ）
sawing	（ ）	bars	（ ）

Read through the above information again with your workmates and try to fill in the



blanks in the following short passage. Dictate the words and expressions for each other among your roommates.

Metal cutting can be defined as a _____ during which the shape and dimensions of a _____ are changed by removing some of the material in the form of _____. The latter are separated from the work piece by means of a _____.

Among all the manufacturing methods, _____ is perhaps the most important. _____ and _____ are subjected to subsequent machining operations to acquire the precise dimensions and surface finish required. In fact, machining comprises a group of operations that involve _____ basic chip-producing processes, namely _____, _____, _____, _____, _____, _____, and _____.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

1．First translate the following sentences about the primary motion and the feed motion with your cooperators.

（1）Among all the manufacturing methods, metal cutting is perhaps the most important.

（2）Machining comprises a group of operations that involve seven basic chip-producing processes, namely shaping, turning, milling, drilling, sawing, broaching, and grinding.

（3）Metal cutting can be defined as a process during which the shape and dimensions of a work piece are changed by removing some of the material in the form of chips.

2．The following expressions we may use, before we finish off the task, please make out their Chinese meaning with the help of your teammates or dictionary or the internet.

metal cutting	shape and dimensions
work piece	chips
cutting tool	geometric characteristics
forging and casting	surface finish
drilling	bars
plates	broaching
shaping	turning
milling	sawing
broaching	grinding

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please compare the differences among

seven basic chip-producing processes.

shaping	
turning	
milling	
drilling	
sawing	
grinding	
broaching	

Read the following materials with the help of your colleagues and then solve the problems after the information.

The basic tool-work relationship in cutting is adequately described by means of following factors: tool geometry, cutting speed, feed, depth of cut, chip width, area of cut.

Tool geometry: The cutting tool must be made of an appropriate material; it must be strong, tough, hard, and wear resistant. The tool's geometry, characterized by planes and angles, must be correct for each cutting operation.

Cutting speed: The cutting speed v is the instantaneous velocity of the primary motion of the tool relative to the work piece (at a selected point on the cutting edge).

The cutting speed for turning, drilling, and milling processes can be expressed as

$$v = dn \text{ m/min}$$

Where v is the cutting speed in m/min, d is the diameter of the work piece to be cut in meters, and n is the work piece or spindle rotation in rev/min. Thus v, d, and n may relate to the work material or the tool, depending on the specific kinematics pattern. In grinding the cutting speed is normally measured in m/s.

Feed: The feed motion f is provided to the tool or the work piece and, when added to the primary motion, leads to a repeated or continuous chip removal and the creation of the desired machined surface. The motion may proceed by steps or continuously. The feed speed v is defined as the instantaneous velocity of the feed motion relative to the work piece (at a selected point on the cutting edge). For turning and drilling, the feed f is measured per revolution (mm/rev) of the work piece or the tool; for planning and shaping f is measured per stroke (mm/stroke) of the tool or work piece. In milling the feed is measured per tooth of the cutter (mm/tooth) that is, f is the displacement of the work piece between the cutting action of two successive teeth. The feed speed v (mm/min) of the table is therefore the edge forms with the plane.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please differentiate the following terms. Match the basic chip-producing processes to their measurements.

mm/rev	planning and shaping
mm/stroke	milling
mm/tooth	turning and drilling

Tick out which of the following items are belong to basic tool-work relationship in cutting after reading the above materials and discussing with your workmates.

tool geometry	（ ）	cutting speed	（ ）
feed	（ ）	depth of cut	（ ）
chip width	（ ）	area of cut	（ ）

Read the above information again and then discuss with your roommates, then finish off the following exercises. What is the letter mean in the following formula?

The cutting speed for turning, drilling, and milling processes can be expressed as

$$v = dn \text{ m/min}$$

v	
d	
n	
m/min	
m/s	

Translate the following sentences about the basic tool-work relationship in cutting with your cooperators.

（1）The motion may proceed by steps or continuously.

（2）The basic tool-work relationship in cutting is adequately described by means of following factors: tool geometry, cutting speed, feed, depth of cut, chip width, area of cut.

（3）The cutting tool must be made of an appropriate material; it must be strong, tough, hard, and wear resistant.

（4）The cutting speed *v* is the instantaneous velocity of the primary motion of the tool relative to the work piece.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

Practice spoken English.

Mr. Cheng: Good morning, Mr. Zhang.
Mr. Zhang: Good morning, Mr. Cheng.
Mr. Cheng: Could you help me?
Mr. Zhang: What can I do for you?
Mr. Cheng: Can you tell me the definition of metal cutting?
Mr. Zhang: Let me try.(After a while)That's not too difficult to me.
Mr. Cheng: What's wrong with it?
Mr. Zhang: Oh ,I look up the book for it.
Mr. Cheng: Oh, I see.
Mr. Zhang: Metal cutting is…
Mr. Cheng: I know it now. Many thanks.
Mr. Zhang: It's my pleasure.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Two Conventional Milling VS Climb Milling

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

conventional	一般的，常规的
VS=versus	对，与……相对
climb	攀登，爬



i.e.=that is	即，就是
regard	认为，考虑
recognize	承认，认识
acceptable	可接受的
frequent	时常发生的，频繁的
frequently	常常，屡次
double	两倍
vibration	振动，摇动
considerable	相当大（或多）的，重要的
considerably	相当大地
prolong	延长，拖延
applicable	可使用的，合适的
duty	责任，功率，税
backlash	间隙，齿轮隙
eliminate	排除，消除
recommend	推荐，介绍
cast	铸件
casting	铸造，铸件
forge	锻工车间
forging	锻造，锻件
tempering	回火
annealing	退火
quenching	淬火
brine	盐水
reheating	重新加热

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

逆铣	顺铣	认为……是
同样	这样	被认为是
刀具寿命，刀具耐用度		重型的
铸铁	如下	麻花钻
高速钢	热处理	热处理工作者
材料的物理性能	淬硬钢	临界点
内应力	临界温度	

There are two methods of milling, i.e. conventional or up milling and climb or down milling.

In conventional milling, the cutter rotates against the direction of feed. This method has long been regarded as the only practical way to use milling cutters. Not long ago, climb milling was recognized as an acceptable method of operation. In climb milling, the cutter rotates in the direction of feed.

The advantages of climb milling are as follows:

（1）Feed can frequently be doubled over conventional milling.

（2）Metals can be removed fast without vibration.

（3）Finish can be considerably improved.

（4）Tool life may be prolonged.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）How many methods of milling are there?

（2）What has long been regarded as the only practical way to use milling cutters?

（3）How many advantages of climb milling?

Work with your group members and read the above information again and try your best to solve the following problems.

Please list the advantages of climb milling with the help of your workmates.

	climb milling
advantage Ⅰ	
advantage Ⅱ	
advantageⅢ	
advantageⅣ	

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）In conventional milling, the cutter rotates against the direction of feed.

（2）In climb milling, the cutter rotates in the direction of feed.



（3）One of the advantages of climb milling is that finish can be considerably improved.

Work with your classmates trying to translate the following phrases into Chinese.

methods of milling	up milling	down milling	cutter
feed	milling cutters	vibration	finish
tool life	conventional milling	climb milling	

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

Both conventional milling and climb milling are being employed, because climb milling is not applicable to any milling job. Climb milling can be applied only when the machine is of a heavy-duty type and backlash has been eliminated. Climb milling is not recommended for use on cast iron or forgings. Therefore conventional milling remains useful in milling work.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）Only conventional milling is being employed in workplace. （ ）

（2）Up milling can be applied only when the machine is of a heavy-duty type and backlash has been eliminated. （ ）

（3）Conventional milling is not recommended for use on cast iron or forgings. （ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

_____conventional milling _____ climb millings are being employed, because _____ milling is not applicable to any milling job. _____milling can be applied only when the machine is of a heavy-duty type and backlash has been eliminated. _____milling is not recommended for use on cast iron or forgings. Therefore _____ milling remains useful in milling work.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

milling job	heavy-duty type	backlash	cast iron
forgings	milling work	recommended	employed
applied	eliminated		

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）Since climb milling is not applicable to any milling job, both conventional milling and climb milling are being employed.

（2）Climb milling is not recommended for use on cast iron or forgings.

（3）Climb milling can be applied only when the machine is of a heavy-duty type and backlash has been eliminated.

Observe your workplace and try to understand conventional and climb milling with your teammates if any questions, ask the master for help. Look at the following figures, discuss with your classmates and then write down the means of milling.

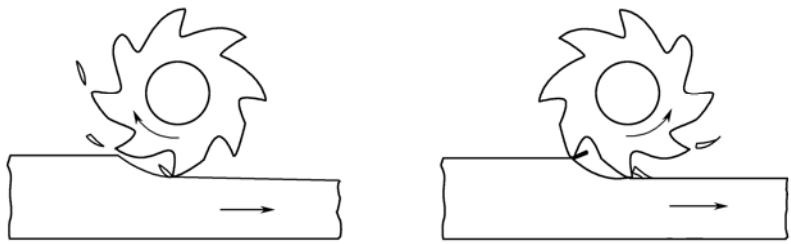


Figure 3-1 Two methods of milling

Observe your workplace and try to understand the methods of milling with your teammates if any questions, ask the master for help. Look at the following figures, discuss with your classmates .

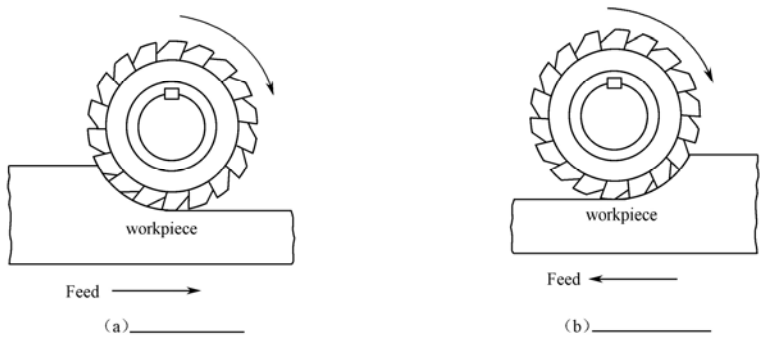


Figure 3-2 Milling methods



Survey your workplace and observe carefully, make out the importance of milling in your workplace and then ask the master for help if any problems.

Practice spoken English.

Mr. Liu: Good afternoon, Mr. Xiong.

Mr. Xiong: Good afternoon, Mr. Liu.

Mr. Liu: I have some trouble with heat treatment. Could you tell me?

Mr. Xiong: What are the problems?

Mr. Liu: Do you know what is the function of heat treatment?

Mr. Xiong: Yes. I think I see. Heat treatment is a method by which the heat treatment can change the physical properties of a material.

Mr. Liu: How many types of heat treatment are there?

Mr. Xiong: There are main operations in the heat treatment of steel: hardening, tempering and annealing.

Mr. Liu: How is hardening operation done?

Mr. Xiong: The hardening operation consists of heating the steel above its critical range and the quenching is in a suitable medium such as water, brine, oil, or some other liquid. Having been hardened, the metal must be given a tempering treatment which consists of reheating the hardened steel to a temperature below the critical range, thus producing the required physical properties.

Mr. Liu: And what is critical temperature?

Mr. Xiong: It is the temperature at which a certain change takes place in the physical condition of the steel.

Mr. Liu: What is the purpose of annealing?

Mr. Xiong: It can soften a work-piece and relieve internal stresses produced by machining.

Mr. Liu: Thank you for telling me about these.

Mr. Xiong: I'm glad to have been of some service.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Three　The function, Tool life, The Shape, The System of Tools

Look at the following words we may use in this scene and match the English and Chinese

meaning in a given time, whoever finishes off it first will be the winner.

engine	分离的，个别的，分开
planning	方法，方式
edge	刨削
separate	运转，操作
manner	发动机
size	大小，尺寸，加工到一定尺寸
operation	扭转
twist	刀口，刀刃，边缘

 The following expressions we may use , before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

单刃刀具	用有效的方法，有效地
多刃刀具	切削刃
普通车床	铰刀

 The metal cutting tool separates chips from the work-piece in order to cut the part to the desired shape and size. There is a great variety of metal cutting tools. Each of them is designed to perform a particular job or a group of metal cutting operations in an efficient manner. For example, twist drill is designed to drill a hole which has a particular size, while a turning tool may be used to turn a variety of cylindrical shapes.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is the purpose of metal cutting tool separating chips from the work-piece?

（2）How many metal cutting tools are there at workplace?

（3）What does a twist drill is designed to do?

（4）What does a turning tool may be used to do?

 Work with your group members and read the above information again and try your best to solve the following problems.

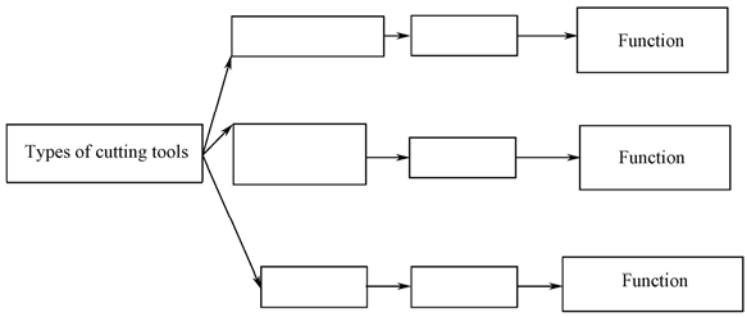
Work at your workplace and find as more cutting tools as possible, list their names and try to remember their English terms.

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

The metal cutting tool _____ chips _____ the work-piece in order to cut the part to the desired _____. There is a great _____ of metal cutting tools. Each of them is designed to perform a _____ job or a group of metal cutting operations in an _____. For example, twist drill is designed to drill _____ which has a particular size, while a turning tool may be used to _____ a variety of cylindrical shapes.

There are three basic types of metal cutting tools: single-point tools, multiple-point tools, and abrasives. A single-point metal cutting tool has a single cutting edge and is used for turning, and planning. The most common machine tool that employs the single-point cutting tool is the engine lathe. Multiple-point tools have two or more cutting edges such as drills, reamers, and milling cutters. The cutting edge is that part of tool where cutting is actually done. Grinding wheels are an example of abrasive cutting tools. Each grinding wheel has a lot of abrasive grains which act as very small cutting tools.

Work with your workmates and try to make out general types of tools. Fill in the following schematic illustration.



Work in groups and read through the above materials carefully with your group members and then finish off the following exercises.

Compare the three basic types of tools.

	single-point tools	multiple-point tools	abrasives
definition			
cutting edges			
tools to be used			

The following expressions we may use, before we finish off the task, please make out their Chinese meaning with the help of your teammates or dictionary or the internet.

cutting tools	single-point tools	multiple-point tools	abrasives
single cutting edge	turning	planning	machine too
engine lathe	drills	reamers	milling cutters
grinding wheels	abrasive cutting tools		

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What are the three basic types of metal cutting tools?

（2）What is a single-point metal cutting tool?

（3）What are the multiple-point tools?

Work with your colleagues in your workplace and solve the following problems with the help of your workmates. Which of the following belong to multiple-point tools?

drills	（ ）	reamers	（ ）	turning	（ ）
grinding wheel	（ ）	planning	（ ）	engine lathe	（ ）
milling cutters	（ ）				

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning.

tooling	可互换的
term	简单的
equipment	复杂的
specific	装备，设备，装置
simple	特殊的
function	工夹具，工艺装备
complex	作用，函数
interchangeable	术语



The following expressions we may use, before we finish off the task, please make out their Chinese meaning with the help of your teammates or dictionary or the internet.

interchangeably	meaning
familiar	charge
be known as	drill press
familiar with	tooling charge

Tooling is the equipment, small or large, simple or complex, that adapts the production machine to the production of a specific part.

Machining requires two kinds of tooling: work-holding devices, such as a drill press vise; and cutting tools, such as drills and reamers.

Work-holding devices are called jigs and fixtures. The two terms are often used interchangeably, but they have different meanings. A jig is a work-holding device that is not fastened to the machine; a fixture is fastened to the machine. A familiar type of jig (or fixture) is the drill press vise that is used to hold work in position for light drilling operations. Such a vise is general-purpose or universal fixture and does not constitute a tooling charge against the job.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is the definition of tooling according to the above information?

（2）What are the two kinds of tooling required in maching?

（3）What is another name for work-holding devices?

Work with your group members and read the above information again and try your best to solve the following problems.

Please think over the two kinds of tooling, discuss with your partners and then write down a piece of paper as the answer sheet for your group.

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

Work-holding devices are called _____. The two terms are often used interchangeably, but they have _____ meanings. A _____ is a work-holding device that is not fastened to the machine; a _____ is fastened to the machine. A

familiar type of jig (or fixture) is the _____ that is used to hold work in position for _____ operations. Such a _____ is general-purpose or _____fixture and does not constitute a tooling _____against the job.

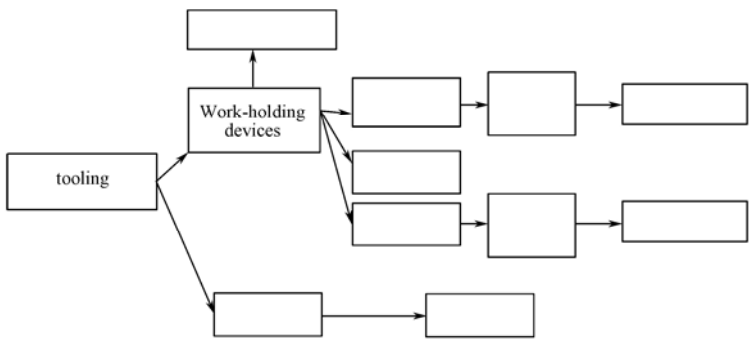
Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）Tooling is the equipment, small or large, simple or complex, that adapts the production machine to the production of a specific part.

（2）Work-holding devices, such as a drill press vise; and cutting tools, such as drills and reamers.

（3）Work-holding devices are called jigs and fixtures.

Work with your workmates and try to make out some definitions of the tools.Fill in the following schematic illustration.



Please differentiate the terms between jigs and fixtures with the help of your classmates. Write down your answers in the following tables.

jigs	fixtures

Most of the machining we do in a machine shop is done with cutting tools. A cutting tool is a hardened piece of metal or other material, such as a grinding wheel, with a cutting edge that cuts



the metal. Cutting tools are made in a wide variety of shapes and sizes. Each of them is designed for a specific purpose.

Discuss with your colleagues and try to share the ideas with your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box. （ ）

（1）Every machining we do in a machine shop is done with cutting tools. （ ）

（2）A grinding wheel is kind of cutting tool . （ ）

（3）A cutting tool can be made by a hardened piece of metal. （ ）

（4）Cutting tools can be produced in a wide variety of shapes and sizes. （ ）

（5）Cutting tools can be designed for many purposes. （ ）

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

machine shop	cutting tools	grinding wheel
cutting edge	shapes and sizes	specific purpose

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and try to make out their Chinese meaning in a given time, whoever finishes off it first will be the winner.

cubic	minimum	compromise	involve
overall	curve	planner	carbide
too…to	typical	subject	ideal
empirical	obey		

Now look at the following Chinese meaning with your colleagues carefully and try your best to make out their English meaning in pairs, finally dictate them for each other among your team workers.

以……为条件的，易受……的		生产（运行）周期	刀头
总成本	硬质合金	解决，算出，加工出	

The higher the cutting speed , the shorter the tool life. By tool life is meant the time of cutting until the tool becomes too worn to do its work effectively and must be sharpened.

Although it cannot be universally applied, many cutting operations on most materials obey the empirical relationship:

$$vT^n=C$$

Where v is the cutting speed in surface meters per second, T is the tool life in cutting seconds, and C is a constant, subject to the variables of work material, cutting tool material, tool shape, and other factors. The constant C is equal to the cutting velocity for a tool life of 1 min.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is the relationship between the cutting speed and the tool life?

（2）What is the general definition of tool life?

（3）What is the empirical formula universally applied on cutting life?

Survey your workplace and observe carefully, make out the tool life and ask the master for help if any problems, write down your experiences in your workplace.

Work with your workmates reading the above materials carefully and then try to understand the tool life. Please cooperate with your partners and then tick out the corresponding responses for each definition.

$$vT^n=C$$

（1）The cutting speed in surface meters per second. （ ）

（2）The tool life in cutting seconds. （ ）

（3）Which equal to the cutting velocity for a tool life of 1 min. （ ）

Work with your workmates reading the above materials carefully and then try to understand the tool life. Please cooperate with your partners and then tick out the factors which affect the constant C in the above formula.

variables of work material （ ） cutting tool material （ ）

tool shape （ ） other factors （ ）

The fastest possible machining speed will give the lowest cost per cubic millimeter or chips, however, this ideal condition may mean frequent tool changes and sharpening.

In the required to change tool bits perhaps 25 cubic millimeter or more of chip making may be lost. The production planner must then select a compromise or over the whole production run, if it



is reasonable short. Or he may balance the cost of tool change and tool sharpening against the speed of machining to provide a minimum overall cost.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

machining speed	lowest cost	tool changes
tool sharpening	production planner	whole production run
a minimum overall cost	reasonable short	

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

（1）The production planner must consider the cost of tool change and tool sharpening against the speed of machining to provide a minimum overall cost. （ ）

（2）25 cubic millimetre or more of chip making may be lost if changing tool. （ ）

（3）The fastest possible machining speed will result in the lowest cost per cubic millimetre or chips if frequent tool changing and sharpening. （ ）

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning.

immediate	检查，调查，考试
substance	直接的，立刻的
dull	变钝，弄钝
examine	刀刃，刀口，叶片
wedge	楔，斜铁
blade	物质

The following expressions we may use , before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

钝的，不快的	极大的，惊人的
锐利，尖锐	凿
经受（得住），耐	冷錾
解释，说明	……或……





The narrower the blade of a cutting tool, the less force or power will be required to “wedge” it through the material to be cut. When cutting soft materials with a cutting tool made of a much harder and stronger substance, the blade can be sharpened to a long thin edge. As the hardness of the material to be cut increases, the strength of the cutting edge must also be increased. Cutting a soft iron bar will cause a fine steel blade to dull immediately, even though the steel in the blade is harder than the metal being cut .If you were to examine the edge of this blade under a glass, you would see that it is either bent or broken. The shape of cutting tool, then, helps to determine the strength of a cutting edge. This explains why a knife edge will dull almost upon contact with metal while the more obtuse cutting edge of a cold chisel will stand up to continuous pounding into metal.

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

_____ narrower the blade of a cutting tool, _____ less force or power will be required to “wedge” it through the material _____ cut. When cutting soft materials with a cutting tool _____ of a much harder and stronger substance, the blade can be sharpened to a long thin _____. As the hardness of the material to be cut increases, the strength of the cutting edge must also be _____. Cutting a soft iron bar will cause a fine steel blade to dull immediately, _____ the steel in the blade is harder than the metal _____ cut .If you were to examine the edge of this blade under a glass, you would see that it is either bent or broken. The _____of cutting tool, then, helps to determine the strength of a cutting edge. This explains why a knife edge will _____ almost upon contact with metal while the more obtuse cutting edge of a cold chisel will _____ to continuous pounding into metal.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates. First translate the following sentences with your cooperators.

（1）The narrower the blade of a cutting tool, the less force or power will be required to “wedge” it.

（2）When cutting soft materials with a cutting tool made of a much harder and stronger substance, the blade can be sharpened to a long thin edge.

（3）As the hardness of the material to be cut increases, the strength of the cutting edge must also be increased.

（4）The shape of cutting tool, then, helps to determine the strength of a cutting edge.

（5）A knife edge will dull contacting with metal while the more obtuse cutting edge of a cold chisel will stand up to continuous pounding into metal.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

（1）The width the blade of a cutting tool, the more force or power will be required to “wedge” it. （　　）

（2）When cutting hard materials with a cutting tool made of a soft substance, the blade can be dull. （　　）

（3）The increase of the hardness of the material to be cut, the strength of the cutting edge must also be increased. （　　）

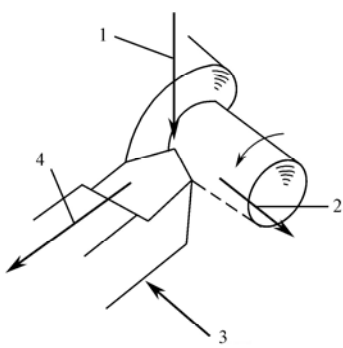
Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）Why cutting a soft iron bar will cause a fine steel blade to dull immediately?

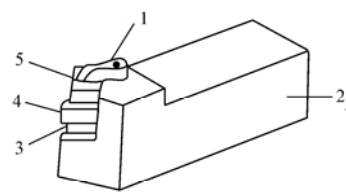
（2）What would happen to the cutting edge when cutting a glass with a fine steel blade?

（3）What would affect the strength of a cutting edge?

Survey your workplace and observe carefully, make out the forces action on a tool and ask the master for help if any problems, translate the terminologies in the following figures into Chinese and then dictate them for each other among your group members.



（a）_____



（b）_____

Figure 3-3_____





Practice spoken English.

Mr.Zhang: Hello,Mr.Chen.

Mr.Chen: Hi,Mr.Zhang.

Mr.Zhang: I have some trouble with the cutting tools.Could you like to help me?

Mr.Chen: Yes,I would like to do it.What are these problems?

Mr.Zhang: How can we distinguish the kinds of cutting tools?

Mr.Chen: We can distinguish them by their shape.

Mr.Zhang: Oh.

Mr.Chen: This is a cutting tool for turning and it have only one point and two edges.

Mr.Zhang: What's this?

Mr.Chen: It is a twist drill. It has two strips of spiral grooves and it usually is used for drilling a hole.

Mr.Zhang: What's that?

Mr.Chen: That is end milling cutter.It is used for machining a plane.

Mr.Zhang: Oh,I see.Thank you for telling me these.

Mr.Chen: You are welcome.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Four Electrical Machining

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and try to make out their Chinese meaning in a given time, whoever finishes off it first will be the winner.

due to	come about	space-age	electrochemical
unique	odd	dissimilar	time-consuming

Now look at the following Chinese meaning with your colleagues carefully and try your best to make out their English meaning, finally dictate them for each other among your team workers.

电化学磨削　　电化学加工　　……所独有的　　相比之下，相反，可是



Most electrical machining processes have come about due to the development of apace-age metal alloys that are tough and hard to machine. Grinding cutting, and shaping with cutting tools are exacting, time-consuming, and expensive processes on such alloys. In some cases, machining with conventional equipment is almost impossible. A material like tungsten carbide, for example, is very difficult to machine even with diamond cutting tools.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）Why do most electrical machining processes have come about?

（2）Why some apace-age metal alloys can't be machined by grinding cutting, and shaping with cutting tools?

（3）What kind of material can't be machined through conventional equipment even with diamond cutting tools?

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

Most electrical machining processes have come about _____ the development of apace-age metal alloys that are _____ and _____to machine. Grinding cutting, and shaping with cutting tools are exacting, _____, and expensive processes on such alloys. In some cases, machining with conventional equipment is almost impossible. A material like tungsten carbide, for example, is very difficult to machine _____ with diamond cutting tools.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）Most electrical machining processes have come about due to the development of apace-age metal alloys.

（2）Grinding cutting, and shaping with cutting tools are exacting, time-consuming, and expensive processes on such alloys.

（3）A material like tungsten carbide is very difficult to machine even with diamond cutting tools.

On standard machine tools, electrical energy is converted by an electric motor into motion

that is transmitted through a series of shafts, pulleys, belts, and gears to a cutting tool. In contrast, the electrical machining processes make direct use of electrical energy. This results in certain abilities that are unique to these processes, machining without tool rotation or without touching the work piece, machining odd shapes, and machining dissimilar metals without loading the tool.

Three major electrical machining processes are EDM (Electrical Discharge Machining), ECM (Electro Chemical Machining), and ECG (Electro Chemical Grinding).

Read the above materials first with your colleagues and then try your best to give out the definition of electrical machining.

Work with your group members and read the above information again and try your best to translate the following terms into Chinese. Then dictate them among your group members.

work piece	electrical machining processes	gears
electrical energy	electric motor	shafts
cutting tool	belts	pulleys
odd shapes	loading the tool	

Survey your workplace and observe carefully, make out the process of electrical machining and ask the master for help if any problems, write down your experiences in your workplace.

Work with your workmates reading the above materials carefully and then try to understand the kinds of processes of electrical machining. Please cooperate with your partners and write down your answers.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）When electrical energy is converted by an electric motor into motion, what kinds of tools can be used to transmit to a cutting tool?

（2）Can you tell the differences between conventional machining and electrical machining?

Read the above information again with your roommates and also observe your

workplace carefully and then write down the advantages of electrical machining?

Practice spoken English.

Mr.Ma: How do you do? Welcome to visit our products. What kinds of equipment are you most interested in?

Mr. Li: I am interested in your NC machine tool. Would you give me a manual?

Mr. Ma: OK.May I know your name, please?

Mr. Li: Yes.Here is my calling card.

Mr. Ma: This is my card. Thank you for coming.

Mr. Li: Would you like to introduce this kind of NC machine tool?

Mr. Ma: No problem. Established in 1950, our company has a long history and abundant experience in manufacturing NC machine tools. We are highly praised by customers because of high quality of our products and our excellent after-sales services. Our products are widely sold in the world.

Mr. Li: Would you give me your quotation?

Mr. Ma: Let me think over, one hundred and twenty thousand RMB.

Mr. Li: Oh,your quotation is on the high side. I would like to visit other companies and then talk the price with you. See you later.

Mr. Ma:Hope to see you again.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning.

chisel	凿
tremendous	钝的，不快的
examine	物质
explain	变钝，弄钝
obtuse	楔，斜铁
wedge	直接的，立刻的
blade	刀刃，刀口，叶片
substance	检查，调查，考试





dull	解释，说明
immediate	极大的，惊人的

The following expressions we may use , before we finish off the task please make out their Chinese meaning with the help of your teammates or dictionary or surfing the internet.

锐利，尖锐	冷鏊
经受（得住），耐	……或……

An electric motor can convert electrical energy into motion on standard machine tools. It is discovered that electrical energy can be directly employed in metal removal. The advantage is that metal of any hardness can be machined by electrical machining processes with good surface finish.

Electrical discharge machining is a form of metal removal in which pulsating direct current is applied to a shaped tool (electrode) and a work-piece, both of which are capable of conducting electricity. The two are held close to each other with a non-conducting fluid serving as an insulator between them. When a voltage high enough to break down the insulator is reached, a spark jumps the gap between the tool and the work-piece. As a result, this spark removes a small portion of material.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What can convert electrical energy into motion on standard machine tools?

（2）Can electrical energy be directly employed in metal removal?

（3）What is the advantage of EDM process?

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

_____ is a form of metal removal in which pulsating direct current is applied to a s_____ (electrode) and a _____, both of which are capable of _____ electricity. The two are held close to each other with a _____ fluid serving as an insulator between them. When a voltage high enough to break down the insulator is reached, _____ jumps the gap _____ the tool _____ the work-piece. As a result, this spark removes _____material.

Read the above materials again with your workmates and then try to translate them into



Chinese, and finally discuss with your workmates.

（1）An electric motor can convert electrical energy into motion on standard machine tools.

（2）Metal of any hardness can be machined by electrical machining processes with good surface finish.

（3）The two are held close to each other with a non-conducting fluid serving as an insulator between them.

 Work with your workmates and try to make out the Chinese meaning of the following phrases.

electric motor	electrical energy	metal removal
electrical machining processes	good surface finish	electrical discharge machining
shaped tool	conducting electricity	non-conducting fluid
insulator	a small portion of	

 The surface finish of a part produced on an EDM machine depends on the size of the sparks generated between it an electrode. Big, powerful sparks produce a rough surface and small, less powerful sparks produce a smooth surface. It is reported that metal removal rates and surface finish are controlled by the frequency and intensity of the spark. High frequency, low-intensity sparks result in a low metal removal rate and produce a smooth finish. Low frequency, high-intensity sparks result in rapid metal erosion and a coarse finish.

 Work with your group members and read the above information again and try your best to solve the following problems.

Please think over the relationship between the energy and the surface, discuss with your partners and then write down a piece of paper as the answer sheet for your group.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What the surface finish of a part produced on an EDM machine depends on?

（2）What kind of sparks can produce a rough surface?

（3）What kind of sparks can produce a smooth surface?

 Survey your workplace and observe carefully, make out the EDM process and ask the master for help if any problems, write down your experiences in your workplace.

 Work with your workmates reading the above materials carefully and then try to understand the EDM process. Please cooperate with your partners and then tick out the factors which affect the surface of the work piece.

（1）The size of the sparks generated between it an electrode. （ ）
（2）Big, powerful sparks. （ ）
（3）Less powerful sparks. （ ）
（4）Frequency of the spark. （ ）
（5）Intensity of the spark. （ ）
（6）High frequency, low-intensity sparks. （ ）
（7）Low metal removal rate. （ ）
（8）Low frequency, high-intensity sparks. （ ）
（9）Rapid metal erosion. （ ）

 Read the above information again with your roommates and also observe your workplace carefully and then write down the advantages of EDM process?

 Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates. First translate the following sentences about EDM process with your cooperators.

（1）The surface finish of a part produced on an EDM machine depends on the size of the sparks generated between it an electrode.

（2）Big, powerful sparks produce a rough surface.

（3）Metal removal rates and surface finish are controlled by the frequency and intensity of the spark.

（4）Low frequency, high-intensity sparks result in rapid metal erosion and a coarse finish.

（5）High frequency, low-intensity sparks result in a low metal removal rate and produce a

smooth finish.

（6）Less powerful sparks produce a smooth surface.

Practice spoken English.

Mr. Wang: Good morning,Mr.Yang.
Mr. Yang: Good morning,Mr.Wang.
Mr. Wang: It seems you are very busy now.
Mr. Yang: Yes,a little.
Mr. Wang: What are you doing?
Mr. Yang: I am measuring a part.
Mr. Wang: Are all sizes of the part correct?
Mr. Yang: No,I find the hole is bigger than the maximum limit of the size.
Mr. Wang: Can it be done over again?
Mr. Yang: No.It has become a waste product.
Mr. Wang: Why does the designer give a tolerance of a part.
Mr. Yang: Because it is virtually impossible to manufacture a part without error and the designer also must consider the dimensions of mating parts to keep the precision of fit, so the limited sizes of a part must be given.
Mr. Wang: Oh,I see.I am very glad to know this. Thanks.
Mr. Yang: You're welcome.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.



Scene Five　Surface Cut

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

customary	习惯的，通常的
least	最小的，最少的

excess	速度，超过
deep	深的
coarse	粗糙的
stand	站，经受
downward	向下的
permit	许可，允许
enough	足够的
allowance	（加工）余量，容差
intend	想要，打算
advisable	可取的，明智的
somewhat	稍微，有点
correspond	符合，相应
corresponding	相应的，符合的，一致的
consumption	消费
accomplish	完成，实现
fine	好的，优良的，精细的
peel	削，剥落

 The following expressions we may use , before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

而不	即使	大批量生产
棘齿	立柱	至少
遥感机构	工作台	粗车
棘爪	棘轮	滑枕
刀具头架	终于	

 It is customary, in shop practice, to take at least two cuts make a job smooth and accurate.

The first cut to take is to remove excess metal from the surface of the work-piece as rapidly as possible. So the cut should be as deep and the feed as coarse as the work-piece and the machine tool will stand. Cutting speed should be adjusted downward, if necessary, to permit this. The first, or roughing cut should be deep enough to size the job, with a suitable allowance for a finishing cut, in one pass whenever possible.

When you intend to adjust the cutting speed or the feed to increase the rate of the production on a machine tool, it is advisable to increase the feed even though the speed must be reduced somewhat. To increase the feed rather than the cutting speed will increase production without a corresponding increase in power consumption and tool wear.



Read the above paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）How many cuts will it take to make a job smooth and accurate?

（2）What is the purpose of the first cut?

（3）In order to remove excess metal from the surface of the work-piece, how should the first cut be?

Work with your group members and read the above information again and try your best to solve the following problems.

What should be considered in the first cut?

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）It would take at least two cuts make a job smooth and accurate.

（2）The cut should be as deep and the feed as coarse as the work-piece and the machine tool will stand.

（3）Roughing cut should be deep enough to size the job in one pass whenever possible.

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

When you intend _____ adjust the cutting speed or the feed to increase the rate of the production on a machine _____, it is advisable to increase the feed even _____ the speed must be reduced somewhat. To increase the feed rather _____ the cutting speed will increase production without a corresponding increase in power_____ and tool _____.

The purpose of the last, or finishing, cut is to finish a work-piece smooth and accurate. To accomplish this, the cut should be shallow and the feed fine and cutting speed should be increased much higher than for the roughing cut. Roughing and finishing operations are usually not performed on the same machine. It is common practice, for example, to rough-turn work-pieces on

lathe, and to finish them on a grinder. Some machines, abrasive machines for instance, are known to perform both roughing and finishing operations.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

last cut	finishing cut	first cut	roughing cut
smooth and accurate	cutting speed	lathe	grinder
abrasive machines			

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）The cut should be shallow and the feed fine and cutting speed should be increased much higher than for the roughing cut.

（2）The purpose of the last, or finishing, cut is to finish a work-piece smooth and accurate.

（3）Abrasive machines are known to perform both roughing and finishing operations.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）The first cut is to finish a work-piece smooth and accurate. （ ）

（2）The last cut is to remove excess metal from the surface of the work-piece （ ）

（3）Some machines can perform both roughing and finishing operations. （ ）

（4）It is common practice to rough on lathe, and to finish on a grinder. （ ）

（5）Roughing and finishing operations are usually not performed on the same machine. （ ）

Survey your workplace and observe carefully, make out the importance of roughing and finishing cut in your workplace and then ask the master for help if any problems, write down your experiences in your workplace.

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

The purpose of the last, or _____, cut is to finish a work-piece _____ and _____. To accomplish this, the cut should be _____ and the feed fine and



cutting speed should be increased much higher _____ for the roughing cut. Roughing and finishing operations are usually not performed on the _____machine. It is common practice, for example, to rough-turn work-pieces on _____, and to finish them on a _____. Some machines, _____ machines for instance, are known to perform both roughing and finishing operations.

Practice spoken English.

Mr. Zhou: Good morning, Miss Yang.
Miss Yang: Hi, Mr. Zhou.
Mr. Zhou: What are you doing now?
Miss Yang: I am working on surface cut.
Mr. Zhou: What's the definition of surface cut?
Miss Yang: ……
Mr. Zhou: Is surface cut important in workshop?
Miss Yang: ……
Mr. Zhou: What is the classification of surface cut?
Miss Yang: They are…….
Mr. Zhou: Thanks a lot.
Miss Yang: You are welcome.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.



Scene Six　Chatter Phenomenon

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

chatter	n. 现象
periodic	v. 振动
phenomenon	n. 动力
dynamic	n. 补救
remedy	a. 周期的

eliminate	v. 消除
amplitude	n. 振幅

 The following expressions we may use , before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

stiffnes　　self-excited vibrations　　forced vibrations

damper　　damping

 The cutting tool and the workpiece start to chatter, because of the cutting conditions and the dynamic characteristics of nature of the machine tool structure. The analysis of the vibrations of the cutting tool is an extremely complex task. We are able to understand how those vibrations initiate and how they can be minimized. If those vibrations are left without remedy, they result in breakage of the cutting tool (especially if it is a ceramic or carbide one) and bad surface quality and may also cause breakage of the whole machine tool.

 Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）Why the cutting tool and the workpiece vibrate?

（2）What are the consequences if those vibrations are left without remedy?

（3）What are the bad results of bad surface quality?

 Work with your group members and read the above information again and try your best to solve the following problems.

Discuss the chatter phenomenon in your workplace with your cooperators.

 Read the above materials again with your workmates and then try to translate the following sentences about the chatter phenomenon into Chinese, and finally discuss with your workmates.

（1）Cutting conditions and the dynamic characteristics of nature of the machine tool structure cause chatter phenomenon.



（2）The analysis of the vibrations of the cutting tool is an extremely complex task.

（3）We are able to understand how those vibrations initiate and how they can be minimized.



There are two basic types of vibrations generated during machining, namely forced vibrations and self-excited vibrations. Forced vibrations take place as a result of periodic force applied within the machine tool structure. This force can be due to an unbalance in any of the machine tool components or interrupted cutting action, such as milling, in which there is a periodic engagement and disengagement between the cutting edges and the workpiece . The frequency of these forced vibrations must not be allowed too come close to the natural frequency of the machine tool system or any of its components; otherwise resonance (vibrations with extremely high amplitude) takes place. The remedy in this case is to try to identify any possible source for imbalances, the stiffness and the damping characteristics of the machine tool are so controlled as to keep the forcing frequency away from the natural frequency of any component and/or the natural frequency of the whole system.

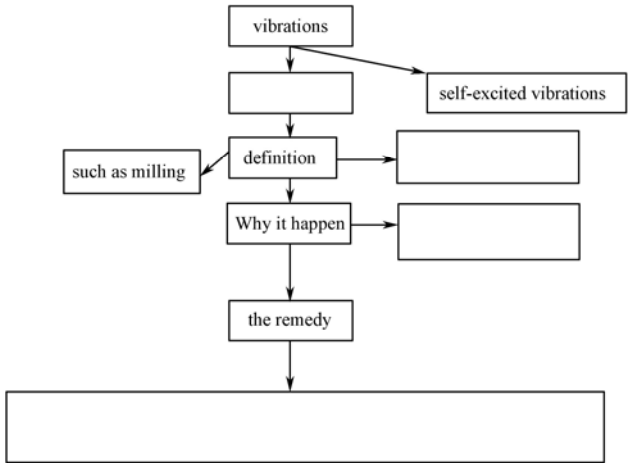


Read through the above information again with your workmates and try to fill in the blanks in the following short passage. Dictate the words and expressions for each other among your roommates.

There are _____ basic types of vibrations generated during machining, namely _____ vibrations and _____ vibrations. Forced vibrations take place as a result of _____ force applied within the machine tool structure. This force can be due to an _____ in any of the machine tool components or interrupted cutting action, such as milling, in which there is a periodic engagement and disengagement between the cutting edges and the workpiece. The frequency of these forced vibrations must not be allowed _____come close _____the natural frequency of the machine tool system or any of its components; otherwise _____ (vibrations with extremely high amplitude) takes place. The remedy in this case is to try to identify any possible source for imbalances, the stiffness and the damping characteristics of the machine tool are _____ controlled _____ keep the forcing frequency _____ from the natural frequency of any component and/or the natural frequency of the whole system.



Read the above materials first with your colleagues and then try your best to give out the definition. Draw a schematic illustration for the relationship about vibration.



Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

vibrations	milling	periodic force
forced vibrations	self-excited vibrations	machine tool structure
periodic engagement	cutting edges	periodic disengagement
natural frequency	resonance	

Read the above material again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）The stiffness and the damping characteristics of the machine tool are so controlled as to keep the forcing frequency away from the natural frequency of any component and/or the natural frequency of the whole system.

（2）The frequency of these forced vibrations must not be allowed too come close to the natural frequency of the machine tool system or any of its components.

（3）This force can be due to an unbalance in any of the machine tool components or interrupted cutting action.

（4）Forced vibrations take place as a result of periodic force applied within the machine tool structure.

（5）There are two basic types of vibrations: namely forced vibrations and self-excited vibrations.



Read the above materials first with your colleagues and then try your best to solve the problems following the short passage.

Self-excited vibration is referred to as chatter. These occur when an unexpected disturbing force, such as a hard spot in the work piece material or sticking friction at the tool-chip interface, causes the cutting tool to vibrate at a frequency near the natural frequency of the machine tool. Resonance takes place, and a minimum excitation produces extremely large amplitude. Such conditions drastically reduce tool life ,result in poor surface quality ,and may cause damage to either or both of the workpiece and the machine tool .This unfavourable condition can be eliminated or at least reduced by controlling the stiffness and the damping characteristics of the system. This is usually achieved by selecting the proper material for the machine bed (cast iron has better damping characteristics than steel), by employing dry bolted joints as energy dissipaters where the vibration energy is absorbed in friction, or by using external dampers or absorbers. Advanced research indicated the potentials of employing layers of composites as a means to safeguard against the occurrence of chatter.

Work with your group members and read the above information again, then describe the self-excited vibration.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is the definition of self-excited vibration?

（2）What are the consequences of resonance?

（3）How can we reduce this unfavourable condition?

（4）What is the function of the potentials of employing layers of composites?

Work with your group members and read the above information again and try your best to compare the differences among the following terms.

	forced vibration	self-excited vibration	natural frequency
definition			
reasons			
machine tool meet			
remedies			





Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

self-excited vibration	disturbing force	sticking friction	natural frequency
large amplitude	stiffness	damping	machine bed
dry bolted joints	vibration energy	external dampers	external absorbers

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）Self-excited vibration occurs when a hard spot in the work piece material or sticking friction at the tool-chip interface.

（2）Poor surface quality may cause damage to either or both of the work piece and the machine tool.

（3）Selecting the proper material for the machine bed by employing dry bolted joints as energy dissipaters.

Survey your workplace and observe carefully, make out the importance of chatter phenomenon in your workplace and then ask the master for help if any problems, write down your experiences in your workplace.

Practice spoken English.

Mr. Wang: Good morning,Mr.Yang.
Mr. Yang: Good morning,Mr.Wang.
Mr. Wang: It seems you are very busy now.
Mr. Yang: Yes,a little.
Mr. Wang: What are you doing?
Mr. Yang: I am thinking about chatter phenomenon.
Mr. Wang: Is chatter phenomenon common?
Mr. Yang: …
Mr. Wang: How can we deal with it?
Mr. Yang: …
Mr. Wang: Why does it happen?

Mr. Yang: Because it is virtually impossible to manufacture a part without chatter and we must consider the …

Mr. Wang: Oh,I see.I am very glad to know this.Thanks.

Mr. Yang: You're welcome.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Seven　Transfer Machines

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning.

complete	圆柱表面，外围
successive	垂直的
synchronize	移动，传递，转移
transfer	完成，使完善
vertical	继承的，连续的
periphery	同步
conveyor	传送装置，传送带

The following expressions we may use , before we finish off the task, please make out their Chinese meaning with the help of your teammates or dictionary or the internet.

进度表	传送机
有效	直线
分度工作台	控制板

Transfer machines complete a series of machining operations at successive stations and transfer the work from one station to the next. They are, in effect, a production line of connected machines when they are synchronized in their operation so that work-piece, after being loaded at the first station, progresses automatically through the various stations to its completion. The automatic machines are of the indexing table or straight-line transfer type.

Parts requiring only a few operations are adapted to indexing table machines, which are made





with either vertical or horizontal units, spaced around the periphery of the indexing table.

The principal feature of transfer machines is that they are provided with suitable handling or transfer means between stations. The simplest and most economical method of handling parts is to move them on a rail or conveyor between stations. When this is impossible, because of the shape of the part, it is necessary to provide a holding fixture or pallet on which the work is clamped.

Read the above paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What are transfer machines?

（2）How many types of transfer machines?

（3）Can work-piece progresses automatically through the various stations to its completion.

Read the above materials again with your workmates and then try to translate the following sentences about transfer machines into Chinese, and finally discuss with your workmates.

（1）The automatic machines are of the indexing table or straight-line transfer type.

（2）The principal feature of transfer machines is that they are provided with suitable handling or transfer means between stations.

（3）It is necessary to provide a holding fixture or pallet on which the work is clamped.

Read through the above information again with your workmates and try to fill in the blanks in the following short passage. Dictate the words and expressions for each other among your roommates.

Parts requiring only a few operations are adapted _____ indexing table machines, which are made with either vertical or _____ units, spaced around the periphery of the indexing table.

The principal feature of_____ machines is that they are provided with suitable handling or transfer means between stations. The simplest and most economical method of handling parts is to move them on a rail or _____ between stations. When this is impossible, because of the shape of the part, it is necessary to provide a _____ fixture or _____ on which the work is clamped.

A single operator may be responsible for the entire operation. He is stationed at a control

board where a panel of lights keeps him informed of conditions around the machine.

Transfer machines range from comparatively small units having only two or three station to long straight-line machines with over 100 stations. They are used primarily in the automobile industry where, by full production schedules, it is possible to offset their high initial cost by saving in labor. Products processed by these machines cylinder blocks, cylinder heads, compressors bodies, and similar parts.

 Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

entire operation	control board	panel
transfer machines	station	long straight-line machines
automobile industry	cylinder heads	cylinder blocks
compressors bodies		

 Read the above materials first with your colleagues and then try your best to give out the definition. Tick out products processed by automobile industry and then translate them into Chinese, finally dictate them for each other among your group members.

cylinder blocks （ ） cylinder heads （ ）

compressors bodies （ ） similar parts （ ）

 Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）Can a single operator do all the entire operation?

（2）How about the range of transfer machines?

（3）How can transfer machines offset the high initial cost?

 Survey your workplace and observe carefully, make out the importance of transfer machines in your workplace and then ask the master for help if any problems, write down your experiences in your workplace.







Practice spoken English.

Miss Candy: Hello, Mr.Smith Nice to meet you!

Mr. Smith: Hi Miss Candy. Nice to meet you ,too.

Miss Candy: What are you doing?

Mr. Smith: I am preparing for some experiments.

Miss Candy: I know your major is engineering. Could you tell me what about the transfer machine?

Mr. Smith: …

Miss Candy: Are transfer machine common in workshop?

Mr. Smith: …

Miss Candy: How transfer machine work?

Mr. Smith: …

Miss Candy: I'm really very grateful to you .

Mr. Smith: Not at all.



New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.



Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.



Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

designer	n. 设计人员
driver	n. 发动机，主动轮
critical	a. 关键的，危险的，临界的
shock	n. &v. 冲击，振动
leather	n. 皮革
furthermore	adv. 而且，此外
rubber	n. 橡胶
plastic	n. 塑料
fabric	n. 纤维品，构造
slippage	n. 滑动量，滑程
precise	a. 精密的，精确的



The following expressions we may use, before we finish off the task, please make out



their English meaning with the help of your teammates or dictionary or the internet.

皮带驱动器	功能	传送
相当地	公差	摇摆
此外	橡胶	织物
滑轮	垂直平面	比率

Belt drives offer a maximum of versatility as power transmission elements. They allow the designer considerable flexibility in location of driver and driven machinery, and tolerances are not critical as in the case with gear drives. Another advantage of belt is that they reduce vibration and shock transmission. Furthermore, belt drives are relatively quiet.

Large flat leather belts were in general use many years ago, when the usual practice was to use one large engine to drive several different pieces of machinery. Some leather belts are in use at this time as flat steel, rubber, plastic, and fabric belts. Light, thin flat belts are practical on high speed machinery where vibration may be a problem.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）How many advantages of the belt drives?

（2）What were the large flat leather belts in use many years ago?

（3）What can we use on high speed machinery where vibration may be a problem?

Work with your group members and read the above information again and try your best to solve the following problems.

Please list the advantages of belt drives with the help of your workmates.

	belt drives
advantage Ⅰ	
advantage Ⅱ	
advantageⅢ	
advantageⅣ	

Read the above materials again with your workmates and then try to translate the

following sentences about belt drives tools into Chinese, and finally discuss with your workmates.

（1）Belt drives offer a maximum of versatility as power transmission elements.

（2）Another advantage of belt is that they reduce vibration and shock transmission.

（3）Large flat leather belts were in general use many years ago, when the usual practice was to use one large engine to drive several different pieces of machinery.

（4）Light, thin flat belts are practical on high speed machinery where vibration may be a problem.

 Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

fabric belt	steel belt	formed steel	tolerances
furthermore	in general	in use	flat steel
gear drives	in location		

 Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

V belts are probably the most common means of transmitting power between electric motor and driven, machinery. Conventional V belts are made of rubber. Most often, both driver and driven pulleys lie in the same vertical plane, and the speed ratio is constant.

Smooth flat belts and V belts depend on faction on the pulleys and some slippages is inherent in their operation. Therefore, speed rations are not precise. Most heavy-duty pulleys are made of cast iron or formed steel.

 Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）Most often, both driver and driven pulleys lie in the different vertical plane, and the speed ratio is constant. （ ）

（2）V belts are probably the one of the means of transmitting power. （ ）

（3）Most heavy-duty pulleys are made of flat steel, rubber and plastic. （ ）



Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

_____ are probably the most common means of transmitting power between electric motor and driven, machinery. Conventional V belts are made of_____. Most often, both driver and driven pulleys lie in _____, and the speed ratio is constant.

Smooth flat belts and V belts depend on faction on the pulleys and some slippages is inherent in their operation. Therefore, _____ are not precise. Most heavy-duty pulleys are made of _____.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

V belts	made of	vertical plane	speed ratio
constant	smooth flat belts	depend on	precise
cast iron	formed steel	slippage	

Read the above materials again and then do your best make out the Chinese meaning of the following sentences with the help of your teammates.

（1）V belts are probably the most common means of transmitting power between electric motor and driven, machinery.

（2）Most often, both driver and driven pulleys lie in the same vertical plane, and the speed ratio is constant.

（3）Most heavy-duty pulleys are made of cast iron or formed steel.

（4）Therefore, speed rations are not precise.

Survey your workplace and observe carefully, make out the importance of belt drives in your workplace and then ask the master for help if any problems.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Then write down the meaning of the following figures. Give a topic to the following figure. Dictate the new words for each other among your group members.

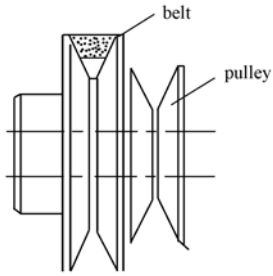


Figure 3-4_____

Practice spoken English.

Wan Ying: Good afternoon,Mr. Chen.

Mr. Chen: Good aftenoon,Wan Ying. Where are you going?

Wan Ying: I am going to the library to borrow some books.

Mr. Chen: What kinds of books do you want to borrow?

Wan Ying: I would like to borrow some books of belt drives.

Mr. Chen: Why?

Wan Ying: I have been learning the course of belt drives, but I have some trouble in learning the belt drive. So I need some reference books.

Mr. Chen: What are the problems? May I help you?

Wan Ying: Yes, what are the advantages of belt drive?

Mr. Chen: Belt drive is a kind of flexibility transmission, so the location between driver and driven machinery can be easily adjusted. Another advantage of belt drive is that it can efficiently reduce vibration and shock transmission, furthermore belt drive is relatively quiet.

Wan Ying: It seems to be a very useful transmission method.

Mr. Chen: Yes, you are right.

Wan Ying: You are very kind. Bye-bye!

Mr. Chen: Bye!

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Eight Machinability and Cutting Fluids

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

 Look at the following words we may use in this scene and match the English and Chinese meaning.

corrosion	n. 标准，基准
rigidity	n. 判断标准，准则，指标
criterion	n. 刚度，硬度，稳定性
absolute	n. 锈，铁锈　v. 上锈
rust	n. 机械（切削）加工性能
machinability	a. 绝对的，确实的
localized	a. 局部的，固定的
fulfill	a. 锻造的，可锻的，可塑的
reference	v. 实现，达到
ductile	n. 腐蚀，铁锈

 The following expressions we may use , before we finish off the task, please make out their Chinese meaning with the help of your teammates or dictionary or the internet.

n. 烟（气），蒸汽	v. 放出，离析，开展，演变
n. 过滤	依靠，取决于
自由切削	切削液

Machinability is a property characterizing of work piece: the case with which that material can be machined. In order to express machinability in a quantitative manner, one of the following methods is used:

（1）The maximum possible rate of chip removal.

（2）Surface finish of the machined work piece.

（3）Tool life.

（4）Energy required accomplishing the cutting operation.

It is clear that the tool life is the most important of these criteria since it plays an important role in maximizing the production while minimizing the production depend upon many factors, such as the sharpness of the cutting edge, the rigidity of the tool, and the possibility of formation of a built-up edge. As a consequence, it is the tool life that is most suitable to be taken as a criterion of machinability.

 Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is the definition of machinability?

（2）What are the factors that affect machinability?

（3）What is the most important of these criteria?

Read through the above information again with your workmates and try to fill in the blanks in the following short passage. Dictate the words and expressions for each other among your roommates.

The tool _____ is the most important of these criteria since it plays an important role in _____ the production while _____the production depend _____ many factors, such _____ the sharpness of the cutting edge, the rigidity of the tool, and the possibility of formation of a built-up _____. As a consequence, it is the tool life that is most suitable to be taken as a _____ of machinability.

Read the above materials again with your workmates and then try to translate the following sentences about machinability into Chinese, and finally discuss with your workmates.

（1）Tool life minimize the production depend upon many factors.

（2）Tool life is most suitable to be taken as a criterion of machinability.

Work with your teammates and read the above material again and then tick out the factors minimizes the production, filling the correspondence parenthesizes.

sharpness of the cutting edge （ ）

the rigidity of the tool （ ）

the possibility of formation （ ）

Since machinability cannot be expressed in an absolute manner, it is appropriate to take a metal of highly machinability as a reference and express the machinability of any other ferrous metal. This metal was chosen as steel SAE-AISI 1112 because of its superior machinability, which exceeds that for any other steel. Such steel is usually referred to as free cutting steel.



machinability index for some metals and alloys

Metal	machinability index
steel SAE 1020	65
steel SAE A2340	45
cast iron	70～80
stainless steel 18～8	25
tool steel	30
Copper	70
Brass	180
aluminum alloy	300&above

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）Can you express machinability? How?

（2）What is free cutting steel?

（3）What is the most machinable metal according to the above table?

The process of metal cutting results in the generation of a large amount of heat and a localized increase in the temperature of the cutting tool. This effect is particularly evident when machining ductile metals. Accordingly, coolants are required to remove any generated heat, to lower the temperature of the cutting tool, and-consequently to increase the tool service life. In order to fulfill such conditions and function properly, the cutting fluids must possess certain characteristics.

（1）The cutting fluid must possess suitable chemical properties, i.e., to be appropriate from the point of view of chemistry. It must not react with the work piece material or cause corrosion in any component of the machine tool. Also, it should not promote the formation of rust or spoil the lubricating oil of the machine bearing and slides whenever it comes in contact with that oil.

（2）The cutting fluids must be chemically stable, i.e., does not change its properties with time.

（3）No poisonous gasses or fumes should evolve during machining, in order to eliminate any possibility of problems regarding the safety or health of the workers.

（4）The lubricating and cooling properties of the cutting fluid must be superior.

（5）The fluid used should be cheap and can be recycled by a simple filtration process.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）The cutting fluids must possess certain characteristics of solving the problems of localized increase in the temperature of the cutting tool. （ ）

（2）The cutting fluids are required to remove any generated heat, to lower the temperature of the cutting tool. （ ）

（3）The cutting fluids must be helpful to increase the tool service life. （ ）

 Survey your workplace and observe carefully, make out the importance of cutting fluids in your workplace and then ask the master for help if any problems, write down your experiences in your workplace.

 Discussing the cutting fluids in your workplace and then cooperate with your group members to think over what the cutting fluids must possess to fulfil such conditions and function properly.

 Read through the above information again with your workmates and try to fill in the blanks in the following short passages. Dictate the words and expressions for each other among your roommates.

The process of metal cutting results _____ the generation of a large amount of heat and a localized increase in the _____ of the cutting tool. This effect is particularly evident when machining ductile metals. Accordingly, coolants are_____ to remove any generated heat, to _____ the temperature of the cutting tool, and-consequently to _____ the tool service life. In order to fulfill such conditions and function properly, the cutting _____ must possess certain characteristics.

 Read the above materials again with your workmates and then try to translate the following sentences about cutting fluid into Chinese, and finally discuss with your workmates.

（1）The cutting fluid must not react with the work piece material or cause corrosion in any component of the machine tool.

（2）The cutting fluid should not promote the formation of rust or spoil the lubricating oil of the machine bearing and slides.

（3）The cutting fluids must not change its properties with time.



（4）No poisonous gasses or fumes should evolve during machining regarding the safety or health of the workers.

（5）The lubricating and cooling properties of the cutting fluid must be superior.

（6）The fluid should be cheap and can be recycled by a simple filtration process.

Translate the following words and expressions into Chinese.

cutting tool	ductile metals	tool service life
cutting fluids	suitable chemical properties	corrosion
rust	lubricating oil	bearing
slides	poisonous gasses	filtration process

Survey your workplace and observe carefully, make out the importance of machinability in your workplace and then ask the master for help if any problems, write down your experiences in your workplace.

Practice spoken English.

Mr. Cheng: Good morning, Mr. Zhang.

Mr. Zhang: Good morning, Mr. Cheng.

Mr. Cheng: Could you help me?

Mr. Zhang: What can I do for you?

Mr. Cheng: I don’t know the machinability and cutting fluids,I go to the library for it, but I can’t find more information about it . Perhaps, you can help me.

Mr. Zhang: Let me try. (After a while)That’s not too difficult for me.

Mr. Cheng: Do you know it?

Mr. Zhang: …

Mr. Cheng: Oh, I see.

Mr. Zhang: Now you can get more from the book.

Mr. Cheng: I know it now. Many thanks.

Mr. Zhang: It’s my pleasure.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn’t know in this scene and then dictate them among his/her group members）.



Scene Nine Hydraulic Powers

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning.

linkage	采用
adoption	刺激，激励
stimulate	比较的，相当的
comparatively	有弹力，恢复力
simplify	连接
resilience	单一化，简单化
virtue	优点，功效
detriment	重磨
regrinding	开动，促使
actuate	损害，损害物

The following expressions we may use , before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

活塞	绝不
独立的，	配套的　无级变速
此外	除……以外
往复式的	活塞型的
液压马达	

The application of hydraulic power in operation on machine tools is by no means new, though its adoption on such a wide scale as exists at present is comparatively recent. It was in fact the development of the modern self contained pump unit that stimulated the growth of this form of machine tool operation.

By far the greater proportion of machine tool hydraulic drives are confined to the linear motions, a rotary pump being used to actuate one or more linear hydraulic motors in the form of double-acting, hydraulic rams, usually of the piston type. In some cases, as in certain hydraulic lathes both the linear motions of the cutting tool and the rotary motions of the work may be hydraulically driven and/or controlled. Such rotary motions are produced by the use of a rotary



hydraulic motor.

Read the paragraph of the above material and do your best to answer the following questions with the help of your classmates.

（1）What stimulated the growth of this form of machine tool operation?

（2）What does the greater proportion of machine tool hydraulic drives do by far?

（3）What kind of pump can usually actuate one or more linear hydraulic motors in the form of the piston type?

Read through the above information again with your workmates and try to fill in the blanks in the following short passage. Dictate the words and expressions for each other among your roommates.

_____ some cases, as in certain hydraulic _____ both the linear motions of the cutting tool _____ the rotary motions of the work may be _____ driven and/or controlled. Such rotary motions are produced by the use of a _____ hydraulic motor.

Read the above materials again with your workmates and then try to translate the following sentences about hydraulic power into Chinese, and finally discuss with your workmates.

（1）The application of hydraulic power as exists at present is comparatively recent.

（2）The development of the modern self contained pump unit stimulated the growth of this form of machine tool operation.

（3）Both the linear motions of the cutting tool and the rotary motions of the work may be hydraulically driven and controlled.

Hydraulic machine tool drive offers a great many advantages. One of them is that it can give infinitely-variable speed control over wide ranges. In addition, they can change the direction of drive as easily as they can vary the speed. As in many other types of machine, many complex mechanical linkages can be simplified or even wholly eliminated by the use of hydraulics.

Flexibility and resilience of hydraulic power is another great virtue of this form of drive. Apart from the smoothness of operation thus obtained, a great improvement is usually found in the surface finish on the work and the tool can make heavier cuts without detriment and will last considerably longer without regrinding.





Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please talk about the advantages about the hydraulic machine tool drive.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the advantages of hydraulic machine tool drive.

（1）It can give infinitely-variable speed control over wide ranges. （ ）

（2）They can change the direction of drive as easily as they can vary the speed. （ ）

（3）Many complex mechanical linkages can be simplified or even wholly eliminated by the use of hydraulics. （ ）

（4）Flexibility and resilience is another great virtue of hydraulic power drive. （ ）

（5）The surface finish of the work can be improved apart from the smoothness of operation. （ ）

（6）The tool can make heavier cuts without detriment and will last considerably longer without regrinding. （ ）

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）Can hydraulic machine tool drive offer infinitely-variable speed control over wide ranges?

（2）Can many complex mechanical linkages be simplified or even wholly eliminated by the use of hydraulics?

（3）Will the tool last considerably longer without regrinding?

Read the above materials again with your workmates and then try to translate the following phrases about the hydraulic powers into Chinese, and finally discuss with your workmates.

hydraulic drive	infinitely-variable speed control	complex mechanical linkages
surface finish	heavier cuts	regrinding

Survey your workplace and observe carefully, make out the importance of hydraulic powers in your workplace and then ask the master for help if any problems, write down your

experiences in your workplace.

Observe your workplace and try to understand this phenomenon of hydraulic powers with your teammates, if any questions, ask the master for help. Look at the following figures, discuss with your classmates and then write down why overlapping tolerances can create fit problems.

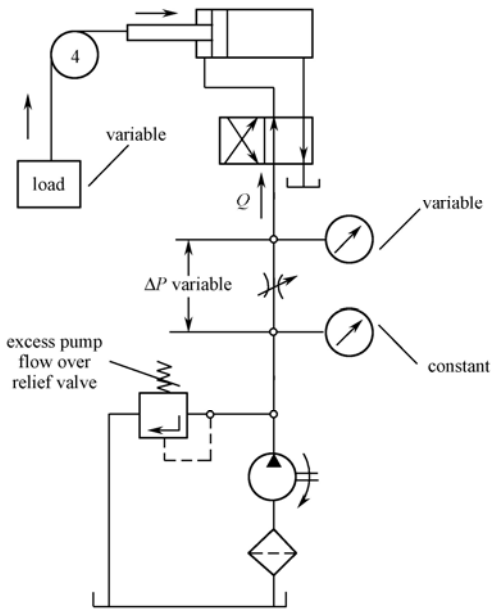


Figure 3-5 Simple restrictor type flow control valve

Practice spoken English.

Mr. Zhou: Good morning, Miss Yang.

Miss Yang: Hi, Mr. Zhou.

Mr. Zhou: I haven't seen you for a long time.What are you doing now?

Miss Yang: I am working on a hydraulic power station,so I am busy.

Mr. Zhou: Oh ,I see.Would you mind asking you some questions?

Miss Yang: No problem. What do you want to know?

Mr. Zhou: Where is hydraulic power used for?

Miss Yang: It can be used for controlling machine tools,automatic production lines and so on.

Mr. Zhou: What are the advantages of hydraulic power to control machine tools?

Miss Yang: We can easily change the feed rate of machine tools, simplify the construction of machines and improve the automatic level of machine tools.

Mr. Zhou: It seems that hydraulic power is very useful.

Miss Yang: Yes,in many aspects.

Mr. Zhou: You are so kind.
Miss Yang: For my pleasure.
Mr. Zhou: Bye-bye!
Miss Yang: Bye!

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Ten Soldering and Brazing

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning.

solder	焊料
soldering	锡焊，软钎焊
braze	铜焊
brazing	铜焊（接）
join	连接，结合
joint	接缝，结合处
bismuth	铋
cadmium	镉
coat	涂上
coating	涂层
flux	助溶剂
stearine	甘油
vaseline	凡士林
spelter	硬钎焊料

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

酸洗液	氧化膜
氯化锌	纯铜烙铁
硬焊料	



There are a number of methods of joining metal articles together, depending on the type of metal and the strength of the joint which is required.

Soldering gives a satisfactory joint for light articles of steel, copper or brass, but the strength of soldered joint is rather less than a joint which is brazed, riveted or welded. These methods of joining metal are normally adopted for strong permanent joint. Soldering is the process of joining two metals by a third metal to be applied in the molten state. Solder consists of tin and lead, while bismuth and cadmium are often included to lower the melting point. One of the most important operations in soldering is that of cleaning surfaces to be joined, this may be done by some acid cleaner. Although the oxides are removed by the cleaning operation, a new oxide coating forms immediately after cleaning, thus prevents the soldered, allowing the solder to unite with the surface of the metal.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）How do we choose the method of joining metal articles together?

（2）What is the function of soldering?

（3）What are the most important operations in soldering?

Tick out which of the following items are belong to the methods of joining metal after reading the above materials and discussing with your workmates.

brazed	（　　）	riveted	（　　）
soldering	（　　）	welded	（　　）

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please write down the advantages and disadvantages of soldering.

advantages	disadvantages

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please tick out the elements we may add in when joining metal together.

stearine	()	flux	()
zinc chloride	()	cadmium	()
tin	()	acid cleaner	()
vaseline	()	bismuth	()
lead	()		

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）Joining metal articles together depends on the type of metal and the strength of the joint which is required. ()

（2）Soldering gives a satisfactory joint for light articles of steel, copper or brass. ()

（3）Soldering is the process of joining two metals by a third metal to be applied in the molten state. ()

Read through the above information again with your workmates and try to fill in the blanks in the following short passage. Dictate the words and expressions for each other among your roommates.

There are a number of methods of joining metal articles together, depending _____ the _____ of metal and the _____ of the joint which is required.

Soldering gives a satisfactory joint for light articles of steel, copper or brass, but the strength of soldered joint is rather _____ than a joint which is brazed, riveted or welded. These methods of joining metal are normally adopted for strong permanent joint. Soldering is the process of joining two metals by a _____ metal to be applied in the molten state. Solder consists _____ tin and lead, while bismuth and cadmium are often included to _____ the melting point. One of the most important operations in soldering is that of _____ surfaces to be joined, this may be done by some _____ cleaner. Although the oxides are removed by the cleaning operation, a new oxide coating forms immediately after _____ thus prevents the soldered, allowing the solder to unite with the surface of the metal.

Read the following materials with the help of your colleagues and then solve the problems after the information.

Flux is used to remove and prevent oxidation of the metal surface to be soldered, allowing the solder to flow freely and unite with the metal. Zinc chloride is the best flux to use for soldering most ferrous and nonferrous metals, for soldering aluminum; stearine or vaseline is to be used as

fluxes. The soldering copper is a piece of copper attached to steel rod having a handle. The quality of soldering depends to a great degree on the form and size of the soldering copper. Two parts may be perfectly soldered only when the surfaces to be joined have absorbed enough heat to keep solder melted for some time.

In some cases it maybe necessary to connect metal surfaces by means of a hard spelter solders which fuses at high temperature. This kind of soldering is called brazing.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is the function of flux?

（2）What is the best flux for soldering most ferrous and nonferrous metals?

（3）Under what condition two parts may be perfectly soldered?

Tick out which of the following items belong to flux after reading the above materials and discussing with your workmates.

zinc chloride	（ ）	stearine	（ ）
vaseline	（ ）	copper	（ ）
ferrous	（ ）		

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please write down the advantages and disadvantages of soldering and brazing.

	advantages	disadvantages
soldering		
brazing		

Read through the above information again with your workmates and try to fill in the blanks in the following short passage. Dictate the words and expressions for each other among your roommates.

_____ is used to remove and prevent oxidation of the metal surface to be soldered, allowing the _____ to flow freely and unite with the metal. Zinc chloride is the best _____to use for soldering most ferrous and nonferrous metals, for soldering aluminum; stearine or vaseline is to be used as _____. The soldering copper is a piece of copper attached _____ steel rod having a handle. Soldering coppers are made _____ different lengths, forms and weights. The _____ of soldering depends to a great degree on the form and size of the soldering copper. Two parts may be perfectly soldered only when the surfaces to be _____ have absorbed enough heat to keep solder melted for some time.

Read the above materials again with your workmates and then try to translate the following sentences about soldering and brazing into Chinese, and finally discuss with your workmates.

（1）Flux is used to remove and prevent oxidation of the metal surface to be soldered.

（2）Soldering coppers are mead in different lengths, forms and weights.

（3）In some cases it maybe necessary to connect metal surfaces by means of a hard spelter solders which fuses at high temperature.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

Practice spoken English.

John: How do you do! My name is John.

Miss Li: How do you do!

John: Are there any vacancies in your factory?

Miss Li: Yes. We need some new workers. What subject was your major?

John: I majored in mechanical manufacturing, and I think I am good at operating milling machine.

Miss Li: What sort of job do you like to do?

John: I would like to do soldering and brazing. I think I can do my best to it.

Miss Li: Great! What time can you start to work?

John: Anytime.

Miss Li: Very nice. How much do you expect in salary?

John: 7800 Yuan.

Miss Li: OK! Please fill in this form. If anything turns, I'll contact with you.

John: Thank you!

Miss Li: You're welcome.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Eleven　Casting

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning.

cavity	n. 腔，（空）洞	molten	a. 熔化的
ferrous	a. 铁的　含铁的	foundry	n. 铸造
cylinder	n. 汽缸	piston	n. 活塞
wheel	n. 车轮	pattern	n. 模样，模型 木型，型板，模板
shrinkage	n. 收缩，缩减	solidification	n. 凝固，浓缩
facilitate	v. 使容易，便于，促进	mould	n. 铸型　v. 造型，翻砂
drag	n. 下砂箱，下型	sprinkle	v. 撒
ram	v. 撞击	foundry	n. 铸造厂，铸造车间
conveyor	n. 传送带，输送带，传送装置	hopper	n. 砂斗，装料斗，漏斗
flush	a. 同平面的，齐平面的	cope	n. 上砂箱，上型箱，顶层
alignment	n. 对准，成一线，对准中心	dowel	n. 定位销，合缝销
feeder	n. 直浇道，浇道	runner	n. 内浇道，横浇道
cavity	n. 空腔	riser	n.（补缩）冒口
coincide	v. 相重合　相叠合	displace	v. 排除（水，气），位移，变位
feed	n. 增补，补缩	venting	n. 通气
permeability	n. 透气性	gate	n. 流道
turbulence	n. 湍流	via	prep. 通过
vibration	n. 振动	fin	n. 毛刺
flash	n. 毛边		

The following expressions we may use, before we finish off the task, please make out

their English meaning with the help of your teammates or dictionary or the internet.

模型腔	铅锤测量装置
熔炉	汽缸体
型箱，砂箱	活塞环
考虑到，顾及	在适当的位置上
与……平齐，与……一样高	暗销，定位销，合缝销
分型砂	

The word casting is used both for the process as well as for the product. The process of casting is the manufacture of metallic objects (castings) by melting metal, pouring it into a mold cavity, and allowing the molten metal to solidify as casting whose shape is a reproduction of the mold cavity. This process is carried out in foundries, which may be either ferrous (i.e., iron-base) or nonferrous.

The foundry industry has found widespread application and is considered to be the sixth larges in the United States because it enables the production of intricately shaped parts. Examples include plumbing fixtures, furnace parts, cylinder blocks of automobile and airplane engines, pistons, piston rings, machine tool beds and frames, wheels, and crankshafts. In fact, the foundry industry includes a variety of casting processes that can be classified according to one of the following ways:

（1）Mold material and/or procedure of mold production.

（2）The method of the filling up the mold.

（3）The metal of the casting itself.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）The process of casting is the manufacture of metallic objects (castings) by melting metal, pouring it into a mold cavity, and allowing the molten metal to solidify as casting whose shape is a reproduction of the mold cavity.

（2）The foundry industry has found widespread application and is considered to be the sixth larges in the United States because it enables the production of intricately shaped parts.

（3）Plumbing fixtures, furnace parts, cylinder blocks of automobile and airplane engines, pistons, piston rings, machine tool beds and frames, wheels, and crankshafts.

Tick out which of the following items are belong to the products of casting after reading



the above materials and discussing with your workmates.

plumbing fixtures	（ ）	furnace parts	（ ）
automobile	（ ）	airplane engines	（ ）
pistons	（ ）	piston rings	（ ）
machine tool beds	（ ）	frames	（ ）
wheels	（ ）	crankshafts	（ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage. Dictate the words and expressions for each other among your roommates.

The foundry industry can be classified according to one of the following ways:

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）The word casting is used both for the process as well as for the product. （ ）

（2）This process is carried out in foundries. （ ）

（3）The foundry industry includes a variety of casting processes. （ ）

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please write down the process of casting.

The first stage in the production of sand castings must be the design and manufacture of a suitable pattern. Castings patterns are generally made from hard wood and pattern has to be made larger than the finished casting size to allow for the shrinkage that takes place during solidification and cooling. The extent of this shrinkage varies with the type of metal or alloy to be cast. For all but the simplest shapes the pattern will be made in two or more pieces to facilitate molding. If a hollow casting is to be made, the pattern design will include extension pieces so that spaces to accept the sand core are moulded into the sand.

These additional spaces in the mould are termed core prints.

Sand moulds for the production of small and medium sized casting are made in a moulding box. The mould is made in two or more parts in order that the pattern may be removed.

The drag half of the mould box is placed on a flat firm board and the drag half of the pattern placed in position. Facing sand is sprinkled over the pattern placed in position. Facing sand is sprinkled over the pattern and then the mould box is filled with moulding sand. The sand is rammed firmly around the pattern. This process of filling and ramming may be done by hang, but





mould production is automated in a large foundry with the mould boxes moving along a conveyor, first to be filled with sand from hoppers and then to pass under mechanical hammers for ramming. When ramming of the sand is completed, excess sand is removed to leave a smooth surface flush with the edges of the mounding box.

The completed drag is now turned over and the upper, or cope, portion of the moulding box positioned over it. The cope half of the pattern is placed in position, correct alignment being ensured by means of small dowel pins. Patterns for the necessary feeder, runner and riser are also placed in position. Feeder and runner channels should be placed so as to give an even distribution of metal into the mould cavity. The risers should coincide with the highest points of the mould cavity so that the displaced air can readily escape from the mould. The sizes of risers should be such that the metal in them does not freeze too rapidly. An important function of a riser is to act as a reservoir of liquid metal to feed solidification within the mould. A thin costing of dry parting sand is sprinkled into the mould at this stage. This is to prevent the cope and drag sticking together when the cope half is moulded. The cope is now filled with moulding sand and this is rammed firmly into shape in the same manner as in the making of the drag.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is the first stage in the production of sand castings?

（2）Why the pattern must be made larger than the finished casting size?

（3）What are the most important operations in soldering?

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）Castings patterns are generally made from hard wood and pattern has to be made larger than the finished casting size to allow for the shrinkage that takes place during solidification and cooling.

（2）If a hollow casting is to be made, the pattern design will include extension pieces so that spaces to accept the sand core are moulded into the sand.

（3）This process of filling and ramming may be done by hang but mould production is automated in a large foundry with the mould boxes moving along a conveyor, first to be filled with sand from hoppers and then to pass under mechanical hammers for ramming.



Read the above information again and try to understand the meaning of the short passage with your teammates and finally translate the following terms into Chinese.

sand castings	suitable pattern	hard wood and pattern
shrinkage	solidification and cooling	facilitate molding
hollow casting	moulding box	filling and ramming
foundry	conveyor	hoppers
smooth surface flush	feeder and runner channels	mould cavity

Read the following materials with the help of your colleagues and then solve the problems after the information.

After the ramming of sand in the cope is completed, the two halves of the moulding box are carefully separated. At this stage venting of the mould can be done. If necessary, to increase the permeability of the mould. After venting the patterns are carefully removed from both cope and drag, and a gate or gates are carefully cut to connect the runner channel with the main cavity. Gates should be sited to allow for entry into the mould with a minimum of turbulence. Any loose sand is gently blown away and if a core is to be used it is placed in position. The mould is reassembled by placing the cope upon the drag and it is then ready for use. Liquid metal is poured smoothly into the mould via the feeder. Pouring ceases when liquid metal appears at the top of the risers and the feeder channel is also full. When the metal that has been poured into a sand mould has fully solicited, the mould is broken and the casting is removed. The casting still has the runner and risers attached to it and there will be sand adhering to portions of the surface. Sand cores and risers are cut off and returned to the melting furnace. Sand cores are broken and removed and adherent sand is cleaned from the surface by vibration or by sand blasting with dry sand. Any fins or metal flash formed at mould parting lines are removed by grinding and the casting is then ready for inspection.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please write down the procedure of making green-sand molds.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please give each of the following figure a topic after observe them carefully and talk about with your group members.

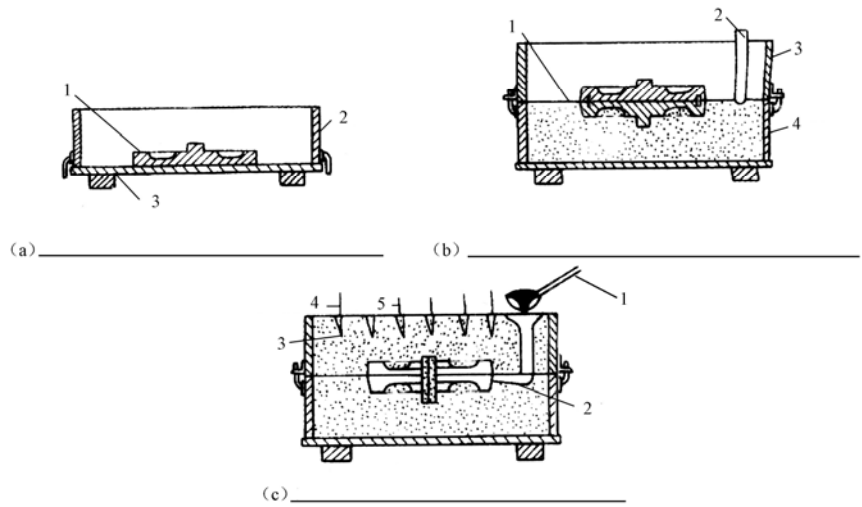


Figure 3-6 Procedure for making green-sand molds (continue)

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）After the ramming of sand in the cope is completed, the two halves of the moulding box are carefully separated. （ ）

（2）After venting the patterns are carefully removed from both cope and drag, and a gate or gates are carefully cut to connect the runner channel with the main cavity. （ ）

（3）Liquid metal is poured smoothly into the mould via the feeder. （ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage. Dictate the words and expressions for each other among your roommates.

Pouring ceases when liquid metal appears at the top of the risers and the _____ channel is also full. When the metal that has been poured into a sand mould has fully _____, the mould is broken and the casting is removed. The casting still has the runner and risers attached _____ it and there will be sand adhering _____ portions of the surface. Sand cores and risers are cut off and returned to the melting furnace. Sand cores are broken and _____ and adherent sand is cleaned from the surface by _____ or by sand blasting with dry sand. Any fins or metal _____ formed at mould parting lines are removed by _____ and the casting is then ready for inspection.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Can you describe the procedure of sand casting?



Practice spoken English.

Mr. Zhang: Hello, Mr. Cheng, what are you doing ?
Mr. Cheng: I am …
Mr. Zhang: This is…, isn't it ?
Mr. Cheng: Yes. It is …
Mr. Zhang: What can it do?
Mr. Cheng: …
Mr. Zhang: What's that?
Mr. Cheng: It is a …
Mr. Zhang: Is this a …?
Mr. Cheng: Yes,it is. It is a …
Mr. Zhang: What kinds of work can it to?
Mr. Cheng: It can …
Mr. Zhang: Thank you for your help.
Mr. Cheng: My pleasure.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Twelve Forging, Stamping and Rolling

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

die	冲模，锻模
draw	拉伸
ingot	铸锭，钢锭
press	压，冲压
hydraulic	冲压，压力机
roll	水力的，液压的
rolling	轧制，滚轧
roller	轧辊





sheet	张，片，薄钢片
strip	条钢，带钢，狭条
impression	凹膛，压痕，型腔
stamp	冲压
stamping	冲压
punch	冲床
punching	冲孔，穿孔
assume	呈现，表现为……形式
rotate	回转，转动
rotation	回转，转动
bar	条钢，型钢
scale	氧化皮
innumerable	无数的
welding	焊接
oxyacetylene	氧乙炔
fuse	熔合
fahrenheit	华氏温度计



The following expressions we may use , before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

点焊	锻焊	液压机，水压机
模锻，落锤锻	氧—乙炔焊	电弧焊
蒸汽锤	完成件	



In drop forging, a piece of metal, roughly or approximately of the desired shape, is placed between die faces having the exact form of the finished piece, and forced to take this form by drawing the dies together, this method is widely used for the manufacture of parts both of steel and brass. Large ingots are now almost always forged with hydraulic presses instead of with steam hammers, since the work done by a press goes deeper.

Metal in the form of hot-rolled or cold-rolled sheets or strips may be formed into many shapes by forcing the sheet into the impressions in metal dies. This process is known as stamping or pressing of metals, and involves many different operations, such as bending, drawing, punching, etc. These operations are successfully carried out through the proper die design and proper operation of the press in which the dies are placed. Sheets or strips of steel, brass, copper, aluminum, or other metal are placed between dies, and a slow action of the power press in which the dies are placed. Sheets of steel, brass, copper, aluminum, or other metal are placed between dies, and a slow action of the power press brings the dies together, forcing the metal to assume the

required shape.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What kind of method can be used to manufacture parts both of steel and brass?

（2）What is drop forging according to the above materials?

（3）What is stamping or pressing of metals?

Work with your group members and read the above information again and try your best to solve the following problems.

Compare the following terms with the help of your workmates.

	drop forging	hot-rolled	cold-rolled
definition			
operation			
applied material			

Read the above materials again with your workmates and then try to translate the following sentences about forging stamping and rolling into Chinese, and finally discuss with your workmates.

（1）In drop forging, a piece of metal, roughly or approximately of the desired shape, is placed between die faces having the exact form of the finished piece, and forced to take this form by drawing the dies together.

（2）Metal in the form of hot-rolled or cold-rolled sheets or strips may be formed into many shapes by forcing the sheet into the impressions in metal dies.

（3）These operations are successfully carried out through the proper die design and proper operation of the press.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Look at the following forging machines. Dictate the new words for each other among your group members.

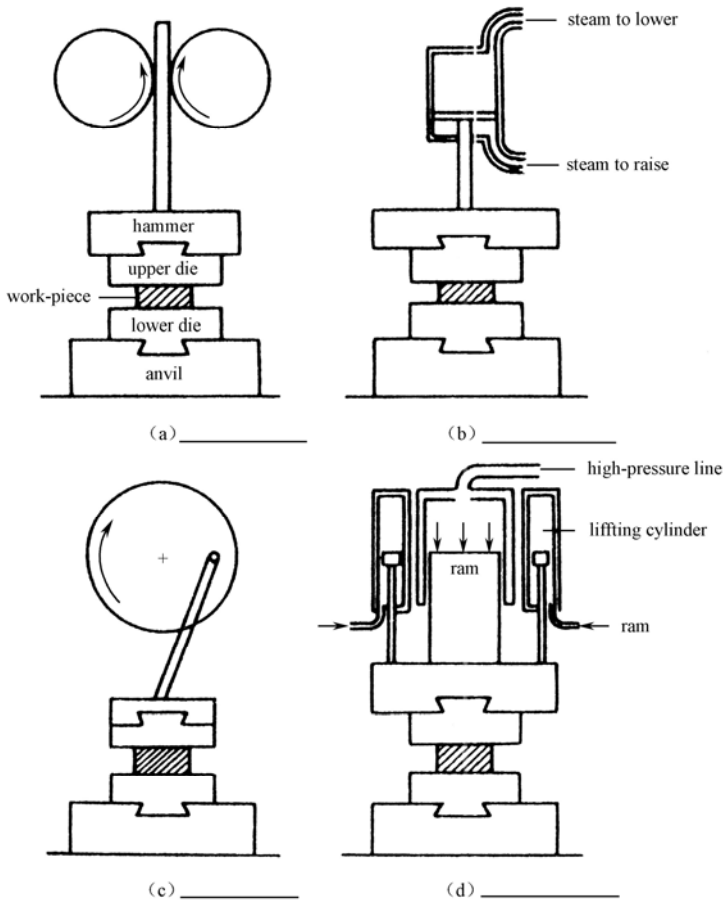


Figure 3-7 Forging machiner

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

Metal in the form of hot-rolled or _____ sheets or strips may be formed into many shapes by forcing the sheet into the _____ in metal dies. This process is known as stamping or pressing of metals, and involves many different _____, such as bending, drawing, punching, etc. These operations are successfully carried _____ through the proper die design and proper operation of the press in _____ the dies are placed. Sheets or strips of steel, brass, copper, aluminum, or other metal are placed between _____, and a slow action of the power _____ in which the dies are placed. Sheets of steel, brass, copper,

aluminum, or other metal are placed between _____, and a slow action of the power press brings the dies _____, forcing the metal to assume the required shape.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please tick out the correct items.

Stamping or pressing of metals involves many different operations:

bending （ ） drawing （ ） punching （ ）

Rolling is the process of shaping metal in a machine called rolling mill. Ingots of metal are rolled by forcing them between two rollers rotating in opposite directions, thus pressing the metal into the required shape .If the rollers have no grooves on their surfaces; the metal is rolled into the required shape. If the rollers have no grooves on their surfaces, the metal is rolled into the form of a sheet or plate. If the rollers have grooves of a certain shape, the metal will take the form of these grooves, thus it may be shaped into the form of bars or rods.

There are two kinds of rolling: hot rolling and cold rolling, before cold rolling, the scale covering the surface of the hot-rolled object should be removed. Cold rolling produces a higher surface finishing sheet and gives it a very exact size, the process has innumerable advantages. Many shapes may be manufactured in quantities at rapid rate and at a relatively low cost.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

rolling mill	grooves	sheet or plate	bars or rods
hot rolling	cold rolling	surface finishing	exact size
innumerable advantages	rapid rate	low cost	

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）Rolling is the process of shaping metal in a machine called rolling mill.

（2）Ingots of metal are rolled by forcing them between two rollers rotating in opposite directions, thus pressing the metal into the required shape.

（3）Many shapes may be manufactured in quantities at rapid rate and at a relatively low cost.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）There are two kinds of rolling: hot rolling and cold rolling . （ ）

（2）Cold rolling produces a higher surface finishing sheet and gives it a very exact size . （ ）

（3）Many shapes may be manufactured in quantities at rapid rate and at a relatively low cost. （ ）

Survey your workplace and observe carefully, make out the importance of rolling in your workplace and then ask the master for help if any problems, compare the differences between them.

	hot rolling	cold rolling
same		
difference		
advantages		
disadvantages		

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

If the rollers have _____ grooves on their surfaces; the metal is rolled into the required shape. If the rollers have _____ grooves on their surfaces, the metal is rolled into the form of a sheet or plate. If the rollers have _____ of a certain shape, the metal will take the form of these grooves, thus it may be shaped _____ the form of bars or rods.

There are _____ kinds of rolling: hot rolling and cold rolling, before cold rolling, the scale covering the surface of the hot-rolled object should be _____. Cold rolling produces a higher surface _____ sheet and gives it a very exact size, the process has innumerable advantages. Many shapes may be manufactured in quantities _____ rapid rate and at a relatively _____ cost.

Practice spoken English.

Mr. Wang: Hello, Mr.Smith. Nice to meet you!

Mr. Smith: Hi, Mr. Wang. Nice to meet you, too.

Mr. Wang: What are you doing?

Mr. Smith: I am preparing for some welding experiments.

Mr. Wang: I know your major is welding engineering. Could you tell me how many kinds of welding methods there are in common use?

Mr. Smith: There are four kinds.

Mr. Wang: What are they?

Mr. smith: They are oxyacetylene welding, arc welding ,spot welding and forged weld.

Mr. Wang: How do the welding work?

Mr. Smith: Welding is the joining of two metal pieces by softening with heat and then pressing hammering or fusing them together.

Mr. Wang: How does the arc welding work in detail?

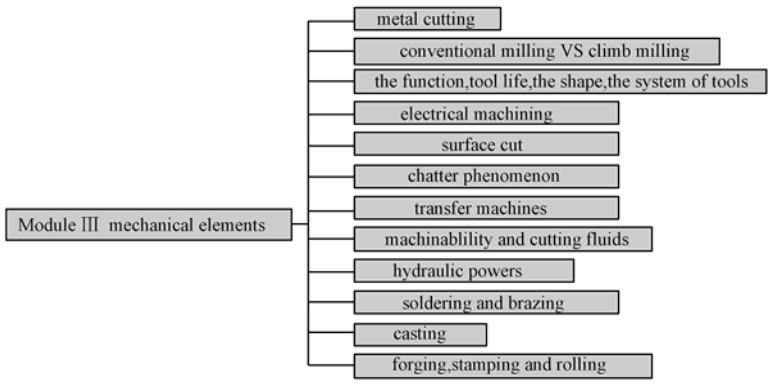
Mr. Smith: Arc welding is the heating of two pieces of metal to be welded by electricity. This heat is the hottest that can be obtained for engineering purposes; it is about 7,232 degrees Fahrenheit the ends are thus melted together, making a welded joint.

Mr. Wang: I'm really very grateful to you.

Mr. Smith: Not at all.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Self assessments

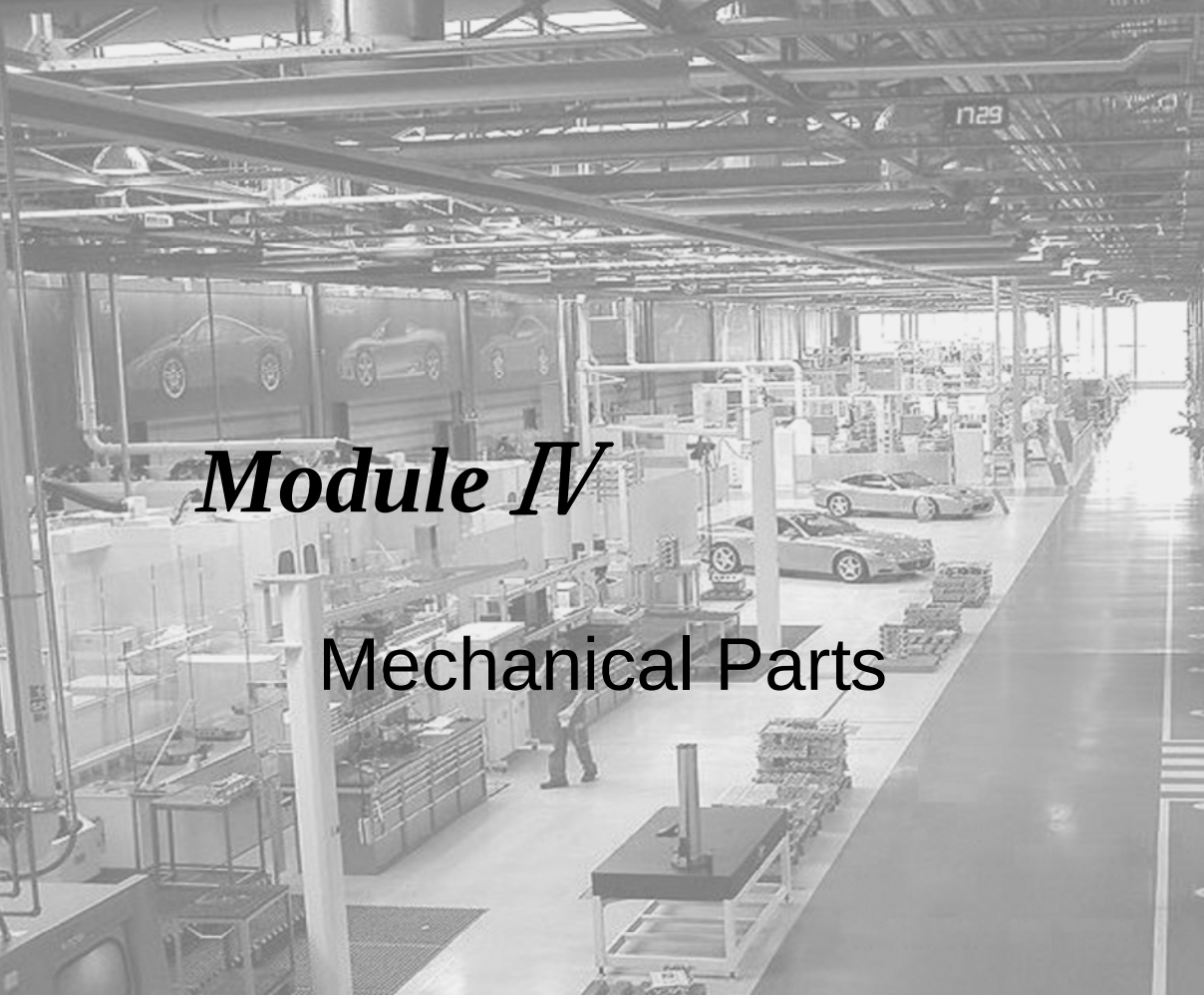


Time_____ Class_____

No.	Name	Evaluation Items				Notes
		Attitude	Presentation& Passage	Exercises	Activities	

Teachers' Observation Record and Evaluation Sheet

item / level	listening	speaking	reading	writing	familiarity of parts
good					
better					
best					
bad					



Module Ⅳ

Mechanical Parts

Guidance on teaching and learning

Teaching	VIP points	Master the application of mechanical parts
	Teaching methodology	Topic learning ,visual memorizing, group or one-centered learning, note-taking ,teamwork, presentation, questioning
	Nominal periods	28 periods
Learning	Learning methodology	In class: intensive and extensive reading ,sentence translation, Out of class: fast writing ,induction, deduction, self-evaluation
	Compulsory theoretic knowledge	Master the terms needed
	Learning procedures	Step 1 read the materials in pairs Step 2 discussion the learning materials with your partners Step 3 check the answers with the help of your group members and teachers Step 4 copy new words and expressions you don't know in this section



Scene One　Couplings

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

coupling	n. 联轴器，连接器
mechanical	a. 机械的，机械学的，力学的
device	n. 装置，机构
disengage	v. 脱离
axial	a. 轴向的，轴的
permanent	a. 永久性的，半固定的
commercial	a. 工业用的，工厂的
flexibility	n. 柔韧性，适应性
collinear	a. 共线的，在同一直线上的
flange	n. 法兰，凸缘
key	n. 键
permissible	a. 容许的
bolt	n. 螺栓
collar	n. 套管，轴环
setscrew	n. 定位螺钉，固定螺钉
variation	n. 变化，变异
concentrically	adv. 同轴，同心
female	a. 内空的，凹形的
bore	v. 镗孔
accommodate	v. 容纳，适应
angularity	n. 斜（倾）度
eccentricity	n. 偏心距，偏心度
torsional	a. 扭转的
absorb	v. 缓冲，吸收
converter	n. 交换器，转换器
misalignment	n. 不对准，不同轴
neoprene	n. 氯丁橡胶
teflon	n. 聚四乙烯





The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

商业轴	传动轴	刚性联轴器
涉及	法兰耦合	衣领耦合
弹性联轴器	以便	有时
由于	旋转	轴

There are two kinds of couplings, rigid coupling or flexible coupling.

Rigid couplings are permanent couplings which by virtue of their construction have essentially no degree of angular, axial, or rotational flexibility, they must be used with collinear shafts.

Flexible couplings may be employed for any or all of these cases. In addition, torsional flexible couplings may be employed to adsorb some of the torque in the shaft, or to permit large amounts of torsional flexibility as in fluid couplings or torque converters.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）How many kinds of couplings are there, what are they?

（2）Which kind of coupling must be used with collinear shafts?

（3）What is the function of the flexible coupling?

Work with your group members and read the above information again and try your best to solve the following problems.

Please list the difference of the rigid couplings and flexible couplings

	rigid couplings	flexible couplings
difference Ⅰ		
difference Ⅱ		
difference Ⅲ		

Read the above materials again with your workmates and then try to translate the following sentences about couplings into Chinese, and finally discuss with your workmates.

（1）Rigid couplings are permanent couplings which by virtue of their construction.

（2）Flexible couplings may be employed for any or all of these cases.

（3）They must be used with collinear shafts.

（4）Flexible couplings may be employed to adsorb some of the torque in the shaft.

Work with your classmates trying to translate the following phrases into Chinese.

kinds of couplings	rigid couplings	flexible coupling	permanent
collinear shafts	in addition	rotational	flexibility
torque converter	permit	essentially	adsorb

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

Survey your workplace again with your classmates and observe carefully then write down the meaning of the following figures. Give a topic to each of the following figures. Dictate the new terminologies for each other among your group members.

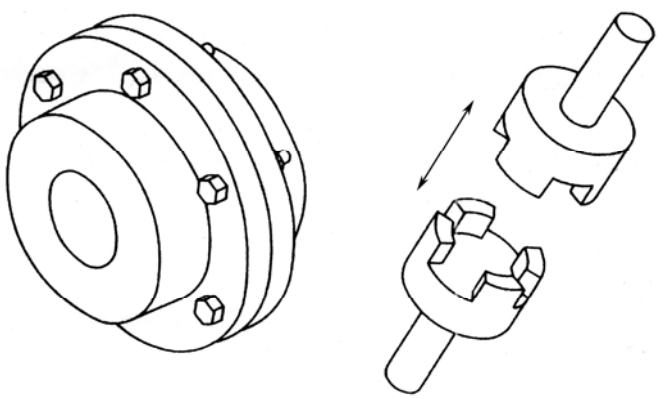


Figure 4-1 Couplings

The flange coupling is perhaps the most common coupling. It has the advantage of simplicity and low cost, but the connected shafts must be accurately aligned to avoid severe bending stress and excessive wear in the bearings.

The collar coupling consists of a cylindrical collar pressed over the ends of the two collinear shafts being connected, approximately one-half of the collar connecting each shaft.





Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）The collar coupling has the advantage of simplicity and low cost. （ ）

（2）The flange coupling consists of a cylindrical collar pressed over the ends of the two collinear shafts being connected. （ ）

（3）The collar coupling is perhaps the most common coupling. （ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

The flange coupling is perhaps _____ coupling. It has the advantage of _____, but the connected shafts must be accurately aligned to avoid severe _____and _____ in the bearings.

The collar coupling consists of a cylindrical collar pressed over the ends of the two collinear shafts being connected, approximately _____ of the collar connecting each shaft.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

flange coupling	collar coupling	advantage	simplicity
low cost	accurately	bending	excessive
cylindrical	approximately	connecting	

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）The flange coupling shown is perhaps the most common coupling.

（2）It has the advantage of simplicity and low cost, but the connected shafts must be accurately aligned to avoid severe bending stress and excessive wear in the bearings.

（3）The collar coupling consists of a cylindrical collar pressed over the ends of the two collinear shafts being connected, approximately one-half of the collar connecting each shaft.

Survey your workplace and observe carefully, make out the importance of coupling in your workplace and then ask the master for help if any problems.

Survey your workplace again with your classmates and observe carefully then write down the meaning of the following figures. Give a topic to each of the following figures. Dictate the new terminologies for each other among your group members.

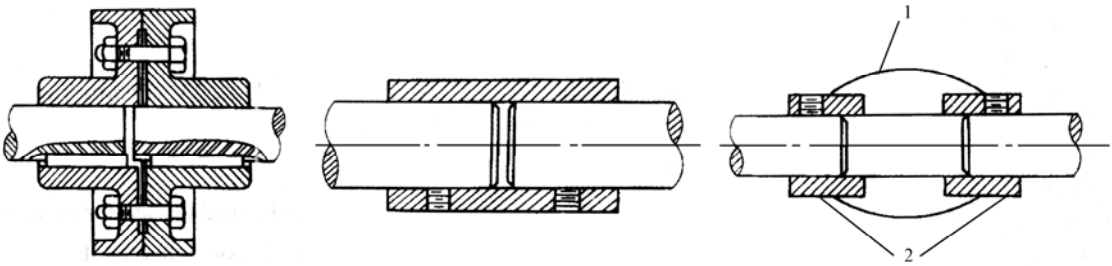


Figure 4-2_____

Practice spoken English.

Mr. Wang: Good morning,Mr.Yang.
Mr. Yang: Good morning,Mr.Wang.
Mr. Wang: It seems you are very busy now.
Mr. Yang: Yes,a little.
Mr. Wang: What are you doing?
Mr. Yang: I am measuring couplings.
Mr. Wang: Are all sizes of the couplings correct?
Mr. Yang: No,I find…than the maximum limit of the size.
Mr. Wang: Can it be done over again?
Mr. Yang: No.It has become a waste product.
Mr. Wang: Why …
Mr. Yang: Because …
Mr. Wang: Oh,I see.I am very glad to know this.Thanks.
Mr. Yang: You're welcome.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Two　Link and Joint

Before you step into this scene, please learn by heart the following words and expressions

with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

link	n. 铰链，杆件，连接件
joint	n. 铰，桁架接点，铰链
rigid	a. 刚性的
idealization	n. 理想化，理想化的事物
deflection	n. 倾斜，挠（弯）曲
strain	n. 应变，变形
inextensible	a. 可伸长的
sense	n. 意义，观念
sprocket	n. 扣链齿，铁链车轮
flexible	a. 易弯曲的，柔性的
revolute	a. 旋转的，转动的 v. 旋转，转动
sphere	n. 球，球状体
angular	a. 角形的，用角度量的
helix	n. 螺旋线（结构）

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

驱动	连杆	旋转
由于	销（子，钉）连接的	自由度
代表	例如	教科书
滑轮	运动链	即时

A link is one of the rigid bodies or members joined together to form a kinematic chain. A perfectly rigid or inextensible link can exist only as a textbook type of model of a real machine member. For typical machine parts, maximum dimension changes are of the order of only a one-thousandth of the part length. We are justified in neglecting this small motion when considering the much greater motion characteristic of most mechanisms. The word link is used in a general sense to include cams, gears, and other machine members in addition to cranks, connecting rods, and other pin-connected components.

The part of a belt between pulleys or a chain between sprockets at a given instant may be considered a rigid link for that instant. Although most mechanisms employ link that are essentially rigid, flexible links are also used. Flexible links, for which deflection can not be neglected, are an area of current research.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）According to the paragraph, what do you think of the link ?

（2）For typical machine parts, what kinds of changes can permit ?

（3）When are we justified in neglecting this small motion?

（4）What is the area of current research?

Work with your group members and read the above information again and try your best to solve the following problems.

Please list the features of the link with the help of your workmates.

	the features
feature I	
feature II	
feature III	
feature IV	

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）A link is one of the rigid bodies or members joined together to form a kinematic chain.

（2）A perfectly rigid or inextensible link can exist only as a textbook type of model of a real machine member.

（3）We are justified in neglecting this small motion when considering the much greater motion characteristic of most mechanisms.

（4）Flexible links, for which deflection can not be neglected, are an area of current research.

（5）For typical machine parts, maximum dimension changes are of the order of only a one-thousandth of the part length.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

rigid link	kinematic chain	inextensible link	maximum
dimension	justified	neglecting	characteristic
due to	current research	instant	component

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

The connections between links that permit relative motion are called joints. The joint between a crank and connecting rod, for instance, may be called a revolute joint or a pin joint. The revolute joint has one degree-of-freedom in that if one element is fixed, the revolute joint allows the other one to rotate in plane. A sphere joint(ball joint)has three degree-of-freedom, it allows relative motion in three angular directions. Some of the practical joint; ball and bearing that are represented by the revolute joint; ball slide represented by the cylinder joint; and ball screws represented by the helix.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）The joints cannot permit relative motion. （ ）

（2）The revolute joint has three degree-of-freedom, it allows relative motion in three angular directions. （ ）

（3）Some of the practical joint; ball and bearing that are represented by the cylinder joint. （ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

_____ (ball joint) has three _____, it allows relative motion in _____. Some of the practical joint; _____ that are represented by the revolute joint; ball slide represented by the_____; and ball screws represented by the helix.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

relative motion　pin joint　element　crank and connecting rod
degree-of-freedom　rotate　sphere joint　practical joint
ball slide　ball screw　helix

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）The connections between links that permit relative motion are called joints.

（2）A sphere joint (ball joint) has three degree-of-freedom; it allows relative motion in three angular directions.

（3）Some of the practical joint; ball and bearing that are represented by the revolute joint; ball slide represented by the cylinder joint; and ball screws represented by the helix.

Survey your workplace and observe carefully, make out the importance of link and joint in your workplace and then ask the master for help if any problems.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Then write down the meaning of the following figures. Give a topic to the following figure. Dictate the new words for each other among your group members.

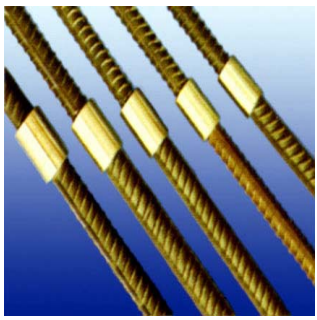


Figure 4-3_____



Figure 4-4_____

Practice spoken English.

Mr. Zhou: Good morning, Miss Yang.
Miss Yang: Hi, Mr. Zhou.

Mr. Zhou: What are you doing now?
Miss Yang: I am checking the link and joint.
Mr. Zhou: Is this …?
Miss Yang: Yes. It is.
Mr. Zhou: Where are…about them?
Miss Yang: This is a link.
Mr. Zhou: What is link?
Miss Yang: Link refers to.
Mr. Zhou: What is the joint?
Miss Yang: It is …
Mr. Zhou: Do you …?
Miss Yang: I would prefer to …
Mr. Zhou: It sounds quite well.
Miss Yang: You will like it in the future, too.
Mr. Zhou: I think so. Thanks a lot.
Miss Yang: You are welcome.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Three Cams

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

cam	n. 凸轮
versatile	a. 多用途的，多方面的
outline	n. 外形（线）；轮廓
secure	v. 保证，获得 a. 可靠的，安全的
manufacture	v. 大规模制造，生产
fit	v.&n. 装配，配合，适合
follower	n. 从动轮
accomplish	v. 到达，完成



framework	n. 构架，框架
attach	v. 附上，加上
automotive	a. 汽车的，与汽车有关的
automatic	a. 自动的，机械的
dishwasher	n. 洗碗的人，洗碗机
calculate	v. 计算
in contact with	与……接触
attach to	附在（连在）……上

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

可利用的	旋转的	圆柱形的
往复运动	担保	实际上
完成	框架	分销商
汽车发动机	自动	计算机

Cams are the most versatile mechanisms available. A rotary cam is a part on a machine which mechanically changes cylindrical motion to reciprocating motion. Since the cam outline can be given a wide variety of shapes, many different types of motion can be secured. The purpose of a cam is to transmit various kinds of motion to other parts of a machine.

Practically every cam must be designed and manufactured to fit specially requirements. Though each cam appears to be quite different from the other, all the cams work in a similar way. In each case, as the cam is rotated or turned, another part in contact with the cam called follower, is moved both left and right, up and down, or in and out. The follower is usually connected to other parts on the machine to accomplish the desired action. The direction the follower moves depends upon the position of the framework which attaches the cam and follower to the machine. Some of the common applications of cams are:

（1）Camshaft and distributor shaft of automotive engine.
（2）Production machine tools.
（3）Automatic of record player.
（4）Printing machines.
（5）Automatic washing machines.
（6）Automatic dishwashers.
（7）Calculating machines, including computers.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）How many common applications of cams are there?

（2）What has long been regarded as the only practical way to use milling cutters?

（3）How do the cams work?

 Work with your group members and read the above information again and try your best to solve the following problems.

Please list the works steps of cams with the help of your workmates.

	how cams work
step I	
step II	
step III	
step IV	

 Read the above materials again with your workmates and then try to translate the following sentences about the function of cams into Chinese, and finally discuss with your workmates.

（1）A rotary cam is a part on a machine which mechanically changes cylindrical motion to reciprocating motion.

（2）The direction the follower moves depends upon the position of the framework which attaches the cam and follower to the machine.

（3）The purpose of a cam is to transmit various kinds of motion to other parts of a machine.

 Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

a wide variety of	appears to be	in each case	in contact with
move in and out	up and down	be connected to	caused by

 Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.



The faster the cam turns, the more rapid is the motion of the follower. The motion of the follower caused by the rotating cam is exactly the same for each complete turn of the cam.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）The follower turns faster ,the cam runs more rapid. （ ）

（2）The motion of the cams and followers are separate. （ ）

（3）The motion of the follower can be effected by the rotating cam. （ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

Each cam _____ quite different from the other, all the cams work in a similar way._____, as the cam is rotated or turned, another part_____ the cam called follower, is _____ both left and right, _____ or _____. The follower usually _____ to other parts on the machine to accomplish the desired action. The direction the follower moves depends upon the position of the framework _____attaches the cam and follower to the machine.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

calculation	motive	attach to	cylindrical
accomplishment	whistle	recommended	employed
applied	eliminated		

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）Though each cam appears to be quite different from the other, all the cams work in a similar way.

（2）The motion of the follower caused by the rotating cam is exactly the same for each complete turn of the cam.

（3）The follower is usually connected to other parts on the machine to accomplish the desired action.

Survey your workplace and observe carefully, make out the importance of cams in your workplace and then ask the master for help if any problems.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Then write down the meaning of the following figures. Give a topic to the following figure. Dictate the new words for each other among your group members.

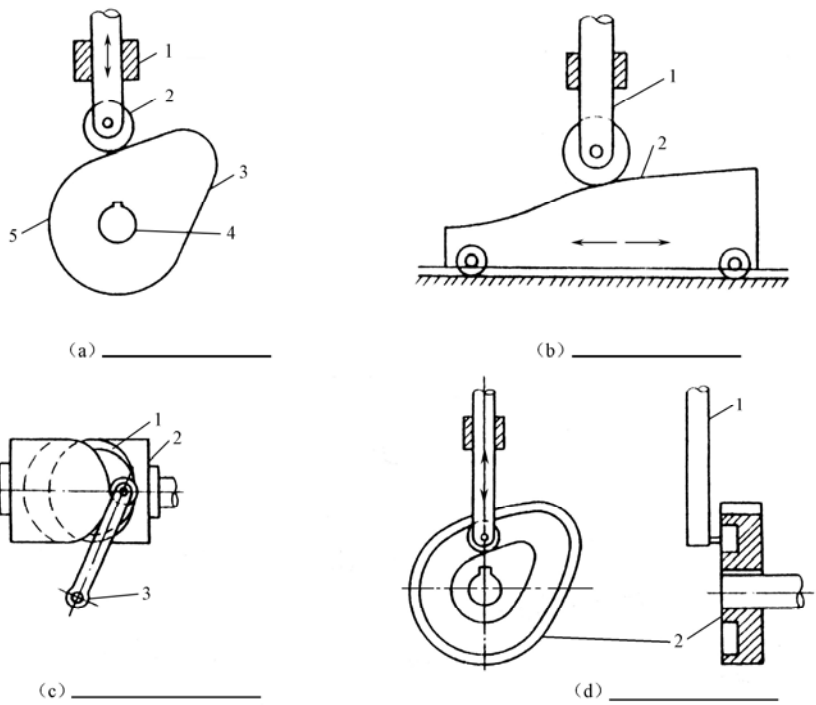


Figure 4-5 Types of cams

Practice spoken English.

Mr.Zhang: Hello,Mr.Cheng.Nice to see you again!
Mr.Cheng: I'm glad to meet you.
Mr.Zhang: What are you doing?
Mr.Cheng: I am preparing a cam.
Mr.Zhang: Oh,cam? What does it mean?
Mr.Cheng: Cam is …
Mr.Zhang: How can we use …?
Mr.Cheng: If …

Mr.Zhang: It seems difficult to …
Mr.Cheng: Not the case.It is very easy for a skilled worker.
Mr.Zhang: Oh,I see.I think I have a long way to go.
Mr.Cheng: Do not worry.You can do your best if you work hard.
Mr.Zhang: You're very kind.
Mr.Cheng: That's OK.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Four　Engine Parts

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

conjunction	结合，联合
knowledge	知识，学问
perform	执行，完成
auxiliary	辅助的，附属的
assist	援助，帮助
performance	执行，完成，工作
nozzle	喷嘴
liner	衬套，套筒，缸套
diameter	直径
bore	缸径，内径，孔，洞
admit	吸入，进入，接纳
discharge	（液体，气体等）排除，放（电）
wrist	肘节，肘杆销
crank web	曲柄臂
cheek	夹板
journal	轴径
flywheel	飞轮
uniform	均匀的





protect	保护
reservoir	储存器，水库
bedplate	底板，座板
deliver	提供，供给，传送
by sight	一看（就）
fuel-injection nozzle	喷油嘴



The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

发动机	组成	特定的
外观	汽缸	辅助部件
汽缸盖	排气阀	活塞
连杆	曲轴	曲轴箱
燃油泵	燃料线	内径
冲程	轴承	或多或少
凸轮轴	定时齿轮	润滑油
燃烧室	喷油器	



Diesel engines vary in out appearance, size, number and arrangement of cylinders, and details of construction. However, they all have the same main parts which, though they may look different, all perform the same functions. Each diesel engine has only a few main working parts, the auxiliary parts are necessary to hold the working parts together or to assist the main working parts performance. The main working parts are the cylinder, the cylinder head, usually holding inlet and exhaust valves, the piston, the connecting rod, the crankshaft, the crankcase and the fuel pump and fuel nozzle.



Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）Which aspects of diesel engines are different?

（2）How many main working parts does each diesel engine have?

（3）What are necessary to hold the working parts together or to assist the main working parts performance?



Work with your group members and read the above information again and try your best to solve the following problems.



Please list the main working parts of diesel engines with the help of your workmates.

diesel engines			
main working parts			

Read the above materials again with your workmates and then try to translate the following sentences about diesel engines into Chinese, and finally discuss with your workmates.

（1）Diesel engines vary in out appearance, size, number and arrangement of cylinders, and details of construction.

（2）Though the main working parts may look different, all perform the same functions.

（3）The auxiliary parts are necessary to hold the working parts together or to assist the main working parts performance.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

arrangement of cylinders	details of construction	main working parts	performance
function	necessary	hold together	assist

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

The crankshaft turns under the action of the piston through the connecting rod and crankpin located between crank webs, or cheeks, and transmits the work from the piston to the driven shaft. The parts of the crankshaft supported by and rotated in the main bearings are called journal.

A flywheel of sufficient weight is fastened to the crankshaft and stores kinetic energy during the power stores and returns it during the other stokes. The flywheel helps to start the engine and also serves to make the rotation of the crankshaft more or less uniform.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.





Tick the correct response in the relevant box.

（1）The crankshaft transmits the work from the driven shaft to the piston. （ ）

（2）The parts of the crankshaft supported by and rotated in the main bearings are called journal. （ ）

（3）A flywheel of sufficient weight is fastened to the crankshaft and stores kinetic energy. （ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

The crankshaft turns under the _____of the piston through the connecting rod and crankpin _____between crank webs, or cheeks, and _____ the work from the piston to the driven shaft. The parts of the crankshaft supported by and rotated in the main bearings are called _____.

A flywheel of sufficient weight is _____ to the crankshaft and stores _____during the power stores and returns it during the other stokes. The flywheel helps to start the engine and also serves to make the rotation of the crankshaft _____uniform.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

sufficient weight	kinetic energy	the driven shaft
start	the rotation of the crankshaft	through
locate	transmit	

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）The parts of the crankshaft supported by and rotated in the main bearings are called journal.

（2）A flywheel of sufficient weight is fastened to the crankshaft and stores kinetic energy during the power stores.

（3）The flywheel helps to start the engine and also serves to make the rotation of the crankshaft more or less uniform.

Survey your workplace and observe carefully, make out the importance of engines in your workplace and then ask the master for help if any problems.

Survey your workplace again with your classmates and observe carefully then write down the meaning of the following figures.

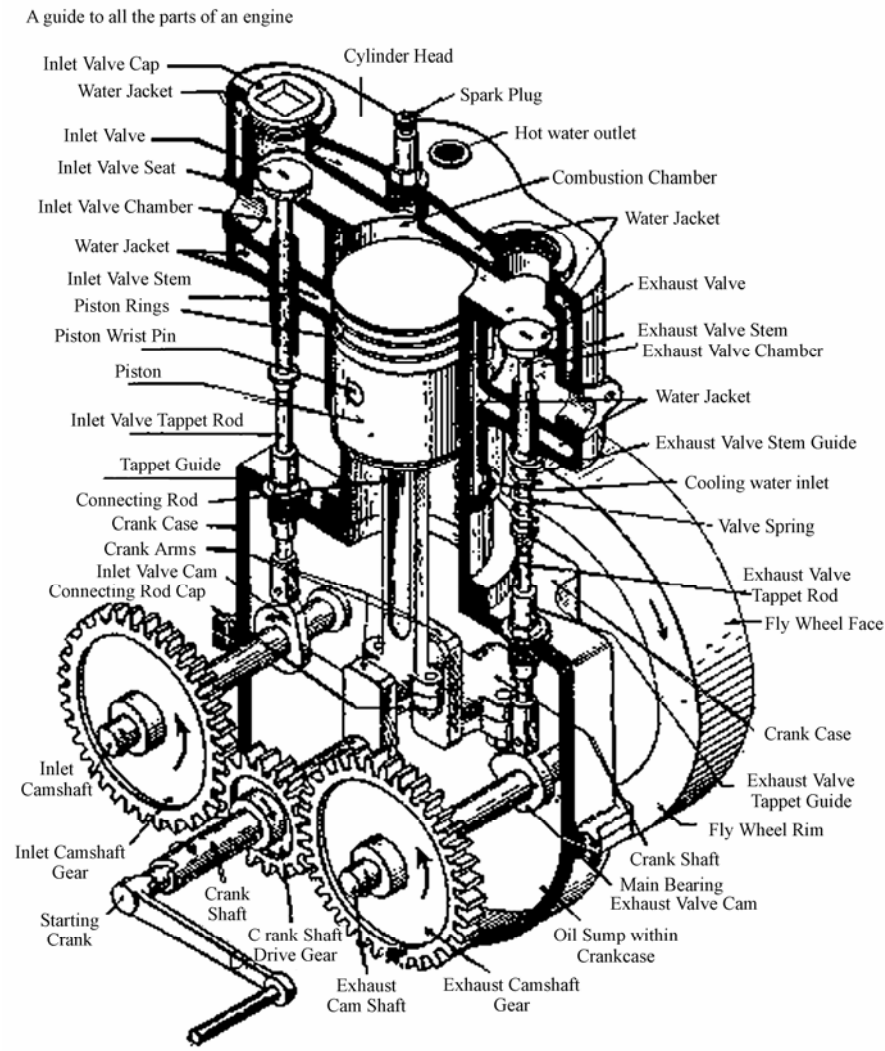


Figure 4-6_____

Practice spoken English.

Mr. Zhang: Hello, Mr. Cheng, what are you doing ?

Mr. Cheng: I am working on the engine parts!

Mr. Zhang: This is a engine, isn't it ?

Mr. Cheng: Yes. It is a engine.

Mr. Zhang: What can it do?

Mr. Cheng: …
Mr. Zhang: What's that?
Mr. Cheng: It is a part of an engine.
Mr. Zhang: Is this a …?
Mr. Cheng: Yes,it is. It is …
Mr. Zhang: What kinds of work can it to?
Mr. Cheng: It can produce …
Mr. Zhang: Thank you for your help.
Mr. Cheng: My pleasure.

 New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Engine Principles

internal: a. of, relating to, or located within the limits or surface; inner. 内部的

combustion: n. the process of burning, or burning. 燃烧，焚烧

reciprocate: v. to move back and forth alternately. 往复移动

cylinder: n. the chamber in which a piston of a reciprocating engine moves; a tube pipe. 汽缸，液压缸

passage: n. a path, channel, or duct through, over, or along which something may pass. 通（水，气）道

attach v. to fasten, secure, or join 连接

pin: n. a slender, usually cylindrical piece of wood or metal for holding or fastening parts together, or serving as a support for suspending one thing from another. 轴销

piston: n. a cylindrical hollow plug that operates in a cylinder 活塞

transmit: v. to send from one person, thing, or place to another; convey. 传动，传输

mount: v. fix 安装，固定

bearing: n. a device that supports, guides, and reduces the friction of motion between fixed and moving machine parts. 轴承

crankshaft: n. a shaft that turns or is turned by a crank 曲轴

diameter: n. the distance across a circle 直径

displacement: n. the amount of air that can be pumped or displaced from cylinder. 排气量，汽缸工作容量

specification: n. exact measurement 参数，规格

stroke: n. the whole distance which a piston moves from T.D.C (上止点) to B.D.C （下止点）冲程



compression: n. the pressure caused when trapped air is squashed into a smaller space. 压缩
camshaft: n. an engine shaft fitted with a cam or cams 凸轮轴
exhaust: v. to put out waste gas 排气

build upon 依赖于……
cylinder block 汽缸体
oil pan 油盆
connecting rod 连杆
spark plug 火花塞
intake valve 进气阀
water jacket 水套
combustion chamber 燃烧室
rotation motion 旋转运动
compression ratio 压缩比
exhaust valve 排气阀

Most automobile engines are internal combustion, such as reciprocating 4-stroke gasoline engines. Here reciprocating means “up and down” or “back and forth”. It is the up and down action of a piston in the cylinder that produces power in a reciprocating engine. Almost all engines of the type are built upon a cylinder block, or engine block, which is an iron or aluminum casting that, contains engine cylinders and passages called water jackets for coolant circulation. The top of the block is covered with the cylinder head, which forms the combustion chamber. The bottom of the block is covered with an oil pan or oil sump.

The linear motion of a piston in a cylinder produces power. However, the motion must be changed into rotary motion to turn the wheels of cars. The piston is attached to the top of a connecting rod by a pin, called a piston pin or wrist pin. The bottom of the connecting rod is attached to the crankshaft. The connecting rod transmits the up-and-down motion of the piston to the crankshaft, which changes it into rotary motion. The connecting rod is mounted on the crankshaft with large bearings called rod bearings.

Displacement and compression ratio are two frequently used engine specifications. Displacement indicates engine size, and compression ratio compares the total cylinder volume to compression chamber volume. The term “stroke” is used to describe the movement of the piston within the cylinder, as well as the distance of piston travel. Depending on the type of engine the operating cycle may require either two or four strokes to complete. Each stroke is named after the action, it performs intake, compression, power and exhaust in that order.

Sentence Translation

（1）汽缸内活塞的线性运动能够做功。

（2）汽缸体工作容量显示发动机大小，而压缩比是汽缸总体积与压缩室体积之比。

（3）冲程一词用于描述活塞在汽缸中的运动和活塞运动的距离。

（4）几乎所有这类发动机都依赖于汽缸体，汽缸体由铁或铝制成，它包括汽缸和用于冷却循环的水套。

（5）连杆将活塞的上下往复运动传输给曲轴，这就将线性运动转化为了旋转运动。

Flow Chart

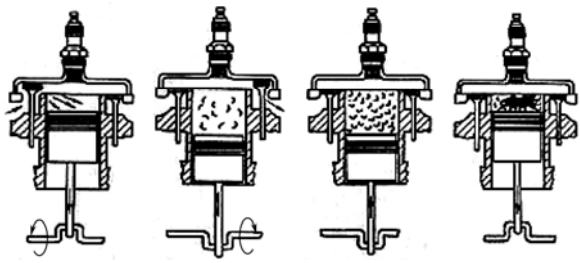


Figure 4-7_____

Please give out each of the above names and then put them in right order.

Matching Words with Relative Meanings

camshaft	活塞
connecting rod	凸轮轴
piston	连杆
camshaft gear wheel	凸轮轴齿轮
crankshaft pulley	油底壳
cylinder block	曲轴皮带轮
intake valve	进气气门
oil pan	汽缸体
crankshaft	凸轮轴正时齿轮
crankshaft timing gear	升降杆
lifter	曲轴
cylinder head	汽缸盖
exhaust valve	飞轮
fly wheel	排气气门
spark plug	火花塞

Engine Lubrication and Cooling

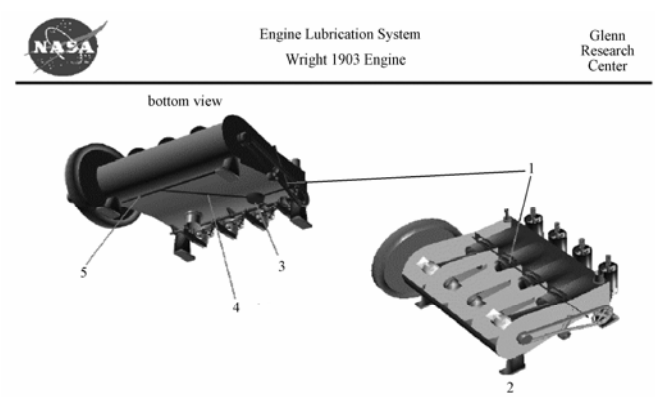


Figure 4-8 Engine lubrication system

The lubrication system engine is very important. If the lubricating system should fail, not only will the engine stop, but many of the parts are likely to be damaged beyond repair. Therefore, when lubrication failure occurs, the engine can seldom be run again without a major overhaul.

The lubricating system delivers oil to the moving parts of the engine to reduce friction and to assist in keeping the parts cool. Most diesel and gasoline engines are equipped with a pressure lubricating system that delivers the oil under pressure to the bearings and bushings and also lubricates the gears and cylinder walls. The oil usually reaches the bearings through passages drilled in the framework of the engine. All of the engine parts are lubricated with oil delivered by a gear-type oil pump. This pump takes suction through a screen from an oil pan or sump. From the pump, the oil is forced through the oil filter and the oil cooler into the main oil gallery. The oil is fed from the main gallery, through individual passages, to the main crank haft bearings and one end of the hollow camshaft. All the other moving parts and bearings are lubricated by oil drawn from these two sources. The cylinder walls and the teeth of many of the gears are lubricated by oil spray thrown off by the rotating crankshaft. After the oil has served its purpose, it drains back to the sump to be used again.

The oil pressure in the line leading from the pump to the engine is indicated on a pressure gauge. A temperature gauge in the return line provides an indirect method for indicating variations in the temperature of the engine parts. Any abnormal drop in pressure or rise in temperature should be investigated at once. It is advisable to secure (shut down) the engine until the trouble has been located and corrected.

Constant oil pressure, throughout a wide range of engine speeds, is maintained by the oil pressure relief valve that allows the excess oil to flow back into the sump. All of the oil from the pump passes through the filter unless the oil is cold and heavy or if the filter (or oil cooler) is clogged. In such cases, the bypass valve (filter bypass valve or cooler bypass valve) is forced open; and the oil flows directly to the engine. Part of the oil fed to the engine is returned through the bypass filter, which removes flakes of metal, carbon particles, and other impurities.

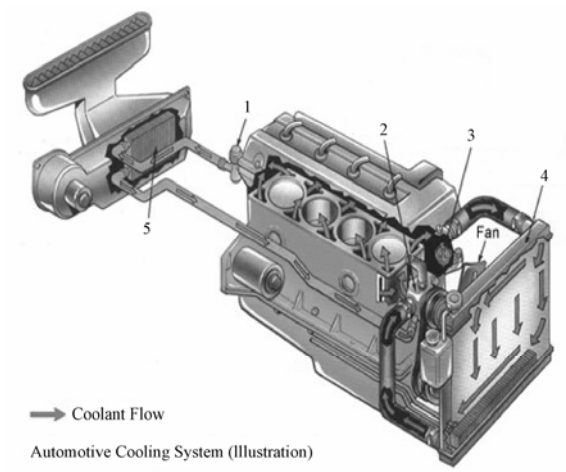


Figure 4-9 Cooling system

Marine engines are equipped with a water cooling system to carry away the excess heat produced in the engine cylinders. Fresh water (coolant) is circulated through passages in the cylinder walls and in the cylinder head, where it becomes hot from absorbing engine heat. The hot coolant then passes through a heat exchanger, where it gives up its heat to a cooling medium, becomes cool, and returns to the engine to remove more heat. The cooling medium may be either air or seawater.

A heat exchanger using air as the cooling medium works like an automobile radiator. A heat exchanger using seawater as the cooling medium may be mounted either on the engine or on the ship's hull. Engine-mounted heat exchangers require seawater to be pumped to and from them; whereas, hull-mounted heat exchangers (keel coolers) are in constant contact with seawater and require the fresh water (coolant) to be pumped through the cooler. The engine cooling system actually is a temperature-regulation system. For a late-model engine, the cooling system must maintain a temperature that is high enough for efficient combustion but not so high that the engine will be damaged. The tow job of the cooling system are to carry excess heat away from the engine and maintain uniform temperature throughout the engine.

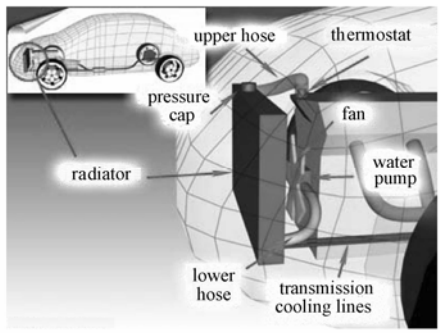


Figure 4-10_____

Fill in the blacks with the right word that can be divided into single alphabets to make the other words completely.

f__rmu__ate	spl__sh	re__ervi__r	g__lle__y
di__sipa__e	co__ros__on	g__oo__e	st_rv_tio__
c_ola_t	va__ori__e	t_ans_er	r_diat_r
_um__	lu_ric_tion	fr_cti_n	

Draw a line to join the words that share the same meaning.

radiator	暖风装置
fan	进水口
oil-cooler tank	端板



header	油道
water outlet	风扇
heater	油底壳
oil cooler	散热器
oil filter	机油冷却器
oil gallery	机油滤清器
thermostat	节温器
oil sump	机油冷却器，油室

Translate the sentences.

（1）No engine can work well without suitable operating temperatures.

（2）As fuel is burned in the engine, heat energy is produced.

（3）If the engine temperature is too high, the pistons would expand and could not move in the cylinders.

（4）If the temperature is too low, the engine would not be warm enough to run.

（5）To keep the engine temperature in balance, a cooling system is necessary.

（6）There are generally two kinds of cooling systems: water cooling system and air cooling system.

（7）The water cooling system means that water is used as a cooling agent to circulate through the engine.

（8）The heat is carried by cooling water to the radiator for dissipation.

（9）The air cooling system means that air is used as a cooling agent to cool the engine parts.

（10）The heat is dissipated by forced air directed over and through radiation fins.

（11）An automobile could not move itself without the aid of friction.

（12）Too much friction in the engine would mean rapid destruction.

（13）Friction can be reduced by the use of lubricating oil.

（14）Lubricating oil has several functions in the lubrication system.

（15）The oil lubricates the moving parts and forms a protective coating on the metal surface.

（16）The oil absorbs or carries the heat away from the engine parts.

（17）The oil washes off dirt away from the engine parts.

（18）The oil forms a good seal between piston rings and cylinder walls.

（19）The lubrication system also contains other mechanical parts such as the oil pump, the oil filter, the oil pressure relief valve, etc.

（20）The oil is supplied for the moving parts of the engine by pump pressure, splashing, or a combination of both.

Engine Lubrication System

The engine lubrication system consists of oil pump, oil filter, oil filler cap, oil dipstick, and oil

pan. The oil pan at the engine bottom holds the oil. The oil pump forces the oil through the filter and internal passages of engine, and then the oil drains back the oil pan through other passages.

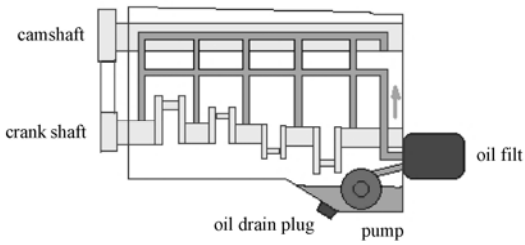


Figure 4-11_____

Oil is used to lubricate the moving parts of a engine. Oil clean dirt and impurities from the engine into the filter and prevent them from moving back to the engine. Oil can also remove part of the heat from the engine. Therefore, changing engine oil frequently will prolong the engine lifetime.



Scene Five Gears

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

function	展开
perpendicular	垂直的
visualize	看见，想象出，目测
unwind	起作用
taut	齿顶高
addendum	拉紧的，绷紧的
axially	齿腹
flank	轴向地
helical	螺旋形的
transmit	转矩，扭矩
torque	平行的
considerably	相当大地
parallel	传（递、动、送、输）
applicable	可使用的，合适的
vital	活的，有生命力的



utilize	啮合，配合
mesh	利用，派上用场
tangent	相切的
generating	滚削
moulding	深痕，齿隙
profile	轮廓，外形
gash	铸造
orientation	改变……的位置
reposition	方位
positive	同时的
simultaneous	正的，肯定的
milling	铣削

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

在……的情况下	取决于	排队，使排成一行
直齿圆柱齿轮	换言之	滚齿机
齿距	齿坯	与……成直角
基圆	铸型	伞齿轮
节圆	剃齿刀	斜齿轮
蜗轮	配对齿轮	速度比
反过来（也是这样）	磨轮	强制转动

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）How many methods of manufacturing gears are there?

（2）What has been regarded as the simplest and the least expensive of gears?

（3）How many advantages by using generating cutter rather than milling cutters?

Work with your group members and read the above information again and try your best to solve the following problems.





Please list the advantages to using generating cutter with the help of your workmates.

	generating cutter
advantage I	
advantage II	
advantage III	

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）A gear is virtual a wheel with very accurately shaped teeth.

（2）Various types of gearing have been developed for different purposes.

（3）Gears constitute one of the best of the various means available for transmitting this motion.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

mesh with	speed ration	parallel to	helical gear
vice versa	hobbing machine	milling	space
gash	orientation	shaving	

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

_____ are usually manufactured by one of the following general processes: milling, generating, or_____, in the_____method of _____, the milling cutter is shaped so as to conform to the shape of the space between the teeth. The_____ is then moved across the face of the gear blank, thus cutting out a space between_____.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

transmit	applicable	infinite	depend on
torque	imaginary	spur gear	pitch circle
engineer	helical		

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）The generating process of gear cutting entails the use of either a hob or a shaper.

（2）Gears to be used for high-speed, high-load applications are not cut accurately enough by the milling process.

（3）The generating process of gear cutting entails the use of either a hob or a shaper.

Survey your workplace and observe carefully, make out the importance of milling in your workplace and then ask the master for help if any problems.

Survey your workplace again with your classmates and observe carefully, then write down the meaning of the following figures.

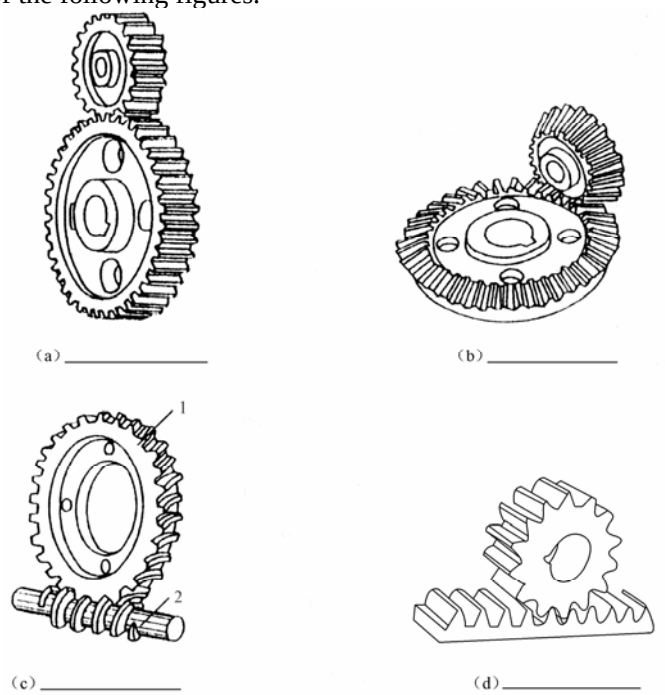


Figure 4-12

Practice spoken English.

Mr. Yang: Morning!
Mr. Smith: Morning!
Mr. Yang: Do you know about the kinds of gears?
Mr. Smith: Yes, there are several kinds of gears: …
Mr. Yang: Could you describe them in detail?
Mr. Smith: OK. … etc.
Mr. Yang: What can the … be used for?
Mr. Smith: The … can be used for … and working parts of machines.
Mr. Yang: Then, what can the … be used for?
Mr. Smith: … can be used for …
Mr. Yang: How about the …?
Mr. Smith: …

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Six Spring

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

spring	n. 弹簧
stiff	a. 硬的，不易移动的
deformation	n. 变形，形状损坏
reverse	a. 颠倒的，向后的，相反的
relatively	n. 相对的，比较的
resilience	n. 弹力，弹性
characteristic	n. 特征，特性
tolerate	v. 容忍，容许
initial	a. 最初的，开始的
division	n. 分开，分配
tensile	a. 张力的，拉力的，紧张的
compressive	a. 压缩的，有压缩力的
cantilever	n. 悬臂，臂



elliptical	n. 椭圆（形）
washer	n. 垫圈（片）
hydraulic	a. 水利的，水压的，液压的
inherent	a. 天生的，固有的，内在的
motive	a. 发动的，原动的

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

高度弹性	敏感的负载	储存能量
主要特点	钢丝弹簧	抵制拉伸
灵活性	固有的	内在的
各种各样的	动力	缓冲车辆
运输	测重量	精密仪器

It is known to all that under action of applied loads machine element is deformed. In most cased, the deformation must be kept low, that is, the element must be kept stiff and rigid .In a spring the reverse effect is desired, and the deformation must be relatively large. The spring being a machine element is usually built to have a high degree of resilience.

A spring is a load-sensitive and energy-storing device, the chief characteristics of which are an ability to tolerate large deformations without failure and to recover its initial size and shape, when loads are removed.

In general, a spring may be classified as either wire spring or flat spring, although there are variations within these divisions. Wire springs include helical springs of round, square, or special-section wire and are made to resist tensile, compressive or torsional loads. Under flat springs are included the cantilever and elliptical types, the clock type power-spring and the flat spring washers, usually called Belleville springs . Although most spring are mechanical and drive their effectiveness from the flexibility inherent in metallic elements, hydraulic and air springs are obtainable.

Springs are used for a variety of purposes ,such as supplying the motive power in clocks and watches, cushioning transport vehicles, measuring weights, restraining machine elements, mitigating the transmission of periodic disturbing forces from unbalanced rotating machines to the supporting structure ,and providing shock protection for delicate instruments during shipment.

Read the paragraph of the above materials and try your best to answer the following questions with the help of your classmates.

（1）Is it true that under action of applied loads machine element will be deformed?

（2）In most cased, the deformation must be kept low, what’s the exact meaning?

（3）What is the characteristics of spring?

 Work with your group members and read the above information again and try your best to solve the following problems.

Please list the functions and types of spring, if you have different ideas, you can also write them down.

	spring			
type				
function				

 Read the following paragraphy again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

Springs are used for a variety of purposes ,such as supplying the motive power in clocks and watches, cushioning transport vehicles, measuring weights, restraining machine elements, mitigating the transmission of periodic disturbing forces from unbalanced rotating machines to the supporting structure, and providing shock protection for delicate instruments during shipment.

 Work with your classmates trying to translate the following phrases into Chinese.

drive their effectiveness　flat spring　load-sensitive　energy-storing
desired　resilience　helical spring
motive power　mitigating the transmission
periodic disturbing force　variety of purpose

 If you have any questions or you are confused about spring, you can ask your teacher for help, please write down his or her words about spring.

In general, a spring may be classified as either wire spring or flat spring, although there are variations within these divisions. Wire springs include helical springs of round, square, or special-section wire and are made to resist tensile, compressive or torsional loads. Under flat springs are included the cantilever and elliptical types, the clock type power-spring and the flat

spring washers, usually called Belleville springs . Although most spring are mechanical and drive their effectiveness from the flexibility inherent in metallic elements, hydraulic and air springs are obtainable.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）Generally speaking, we have two kinds of springs. （ ）

（2）Spring is used to release tensile. （ ）

（3）Although all the spring are mechanical and drive their effectiveness from the flexibility inherent in metallic elements, hydraulic and air springs are obtainable. （ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

A spring is a load-sensitive and _____device, the main _____of spring are an ability to tolerate large deformations without failure and to recover its initial _____, when loads are removed.In general, a spring may be_____ as either wire spring or flat spring, although there are variations within these divisions. Wire springs include helical springs of round, square, or _____wire and are made to resist tensile, _____or torsional loads. Under flat springs are included the cantilever and elliptical types, the clock type power-spring and the flat spring washers, usually called Belleville springs. Although most spring are _____and drive their effectiveness from the _____ inherent in metallic elements, hydraulic and air springs are obtainable.

Read the article again with your workmates and then discuss the following questions:

Besides the founctions metioned in the reading ,can you think of some other founctions about spring? Please write down your results。

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）In most cased, the deformation must be kept low, that is, the element must be kept stiff and rigid.

（2）The chief characteristics of which are an ability to tolerate large deformations without failure and to recover its initial size and shape, when loads are removed.

（3）Wire springs include helical springs of round, square, or special-section wire and are made

to resist tensile, compressive or torsional loads.

Make a list to draw a conclusion about the founction of spring, meanwhile, write down your own ideas about the importance of spring in our daily life.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Seven Bearings

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

seal	排，列
sealing	外部的外面
inner	推力轴
ring	轴向推力
outer	密封的
cage	角位移
separator	能，会
area	范围
curvilinear	隔板
align	自位滚珠轴承
self	曲线的
row	封，密封
angular misalignment	隔离罩
able to+动词原形	自己
axial thrust	环，圈
thrust type of bearing	照看
take care of	内部的，在内的
self-aligning ball bearing	对准



The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

球轴承	外环线	自行调整
负载	小球	角偏心轴
操作条件	吊笼	组装
安装	接触面积	径向轴承
润滑	运行	推力
密封	半径	深槽
内环	微量	

A ball bearing usually consists of four parts: an inner ring, an outer ring, the balls, and the cage or separator. To increase the contact area and permit larger loads to be carried, the balls run in curvilinear grooves in the rings. The radius of the groove is slightly larger than the radius of the ball and a very slight amount of radial play must be provided. The bearing is thus permitted to adjust itself to small amounts of angular misalignment in the assembled shaft and mounting. The separator keeps the balls evenly spaced and prevents them from touching each other on the sides where their relative velocities are the greatest.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）How many parts do a ball bearing usually consist?

（2）How does the ball increase the contact area and permit larger loads to be carried?

（3）How does a separator work?

Work with your group members and read the above information again and try your best to solve the following problems.

Please list the parts of a ball bearing and how does it work.

	name	how does it work
part I		
part II		
part III		
part IV		

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）To increase the contact area and permit larger loads to be carried, the balls run in curvilinear grooves in the rings.

（2）The bearing is thus permitted to adjust itself to small amounts of angular misalignment in the assembled shaft and mounting.

（3）The separator keeps the balls evenly spaced and prevents them from touching each other on the sides where their relative velocities are the greatest.

Work with your classmates trying to translate the following phrases into Chinese.

ball bearing	the cage	larger loads	radial bearing
inner ring	separator	radial play	axial thrust
the balls	contact area	velocities	angular contact

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

Ball bearings are made in a wide variety of types and sizes. The radial bearing is able to carry a considerable amount of axial thrust. However, when the load is directed entirely along the axis, the thrust type of bearing should be used. The angular contact bearing will take care of both radial and axial loads. The self-aligning ball bearing will take care of large amounts of angular misalignment. An increase in radial capacity may be secured by using deep grooves, or by employing a double-row radial bearing.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）All ball bearings are made in the same type and size. （ ）

（2）The radial bearing is able to carry a considerable amount of axial thrust. （ ）

（3）When the load is directed entirely along the axis, the thrust type of bearing cannot be used. （ ）

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

a wide variety of	however	angular misalignment	be secured
be able to	take care of	increase	deep grooves
amount of	self-aligning ball bearing		
radial capacity	double-row radial bearing		

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）The radial bearing is able to carry a considerable amount of axial thrust.

（2）The self-aligning ball bearing will take care of large amounts of angular misalignment.

（3）An increase in radial capacity may be secured by using with deep grooves, or by employing a double-row radial bearing.

Survey your workplace and observe carefully, make out the importance of bearings in your workplace and then ask the master for help if any problems.

Survey your workplace again with your classmates and observe carefully then write down the meaning of the following figures.



（a）_____ （b）_____

Figure 4-13_____

Practice spoken English.

Mr.Zhao: Good morning, Mr Mao.
Mr.Mao: Good morning, Mr Zhao.
Mr.Zhao: What are you doing?
Mr.Mao: I am working on ball bearings.
Mr.Zhao: What's this?
Mr.Mao: It is a ball bearing.
Mr.Zhao: What can it do?
Mr.Mao: We can use it to locate …
Mr.Zhao: Is the ball bearing only be used to …?
Mr.Mao: No.In fact there are many kinds of ball bearings and they can also be used for …
Mr.Zhao: What are its advantages?
Mr.Mao: We can improve …
Mr.Zhao: It's very kind of you to tell me about these.
Mr.Mao: That's all right.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

bearing	轴承
connector	连接器，接头
friction	角接触球轴承
consequently	因此，因而，所以
film	胶卷，薄膜
separator	摩擦
stationary	减摩
mild	滚动轴承
preassembled	预装配的
antifriction	固定的，不变的
intermittent	间歇的



sliding-contact bearings	滑动轴承
inner ring	内座圈（环）
outer ring	分离（分隔）器
co-acting	共同作用
rolling-contact bearings	外座圈
angular-contact bearings	温和的，低碳的

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

连接器	分隔	角接触轴承
载荷应用	噪声	滑动轴承
相对运动的轴承	滑动	减摩轴承
摩擦	自行车	转速
损失功率	轴承	散热
相对运动	吊环	扭转
内环	负荷	

The essential parts of a ball bearing are the inner outer ring, the balls, and the separator .The inner ring is mounted to a shaft and has a groove in which the ball rides .The outer ring is usually the stationary part of the bearing and also contains a groove to guide and support the balls. The separator prevents contact between the balls reduces friction, wear, and noise from the regions where severe sliding conditions would occur.

Read the paragraph of the above materials and do your best to answer the following question with the help of your classmates.

（1）How many essential parts of a ball bearing are there? And what are they?

（2）Would you like to illustrate the differences between the inner outer ring, the balls, and the separator?

（3）What is the function of the separator?

Work with your group members and read the above information again and try your best to solve the following problems.

Please list the functions of different parts of a bearing.

	functions
part I	
part II	
part III	

 Read the materials below with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

The relative motion in bearings is always opposed by friction, and the work done in overcoming friction is lost power in all machines. Consequently, much thought and effort have been devoted to the development of bearings with minimum friction. In all bearings there are two surfaces (one belonging to each of the connected parts) that move relative to one another. To minimize friction, the co-acting surfaces may be partially or completely separated by a film of liquid or gas ,there are known as assemblage of rolling elements such as balls and rollers, these are known as rolling-contact bearing.

 Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

relative motion	consequently	liquid
bearing	minimum friction	gas
friction	co-acting surfaces	rolling elements

 Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

In a few applications where operating conditions are mild, the rings and separator can be omitted and loose balls interposed between the shaft and the housing. This type of bearing is sometimes found in bicycles. The vast majority of ball bearings, however, are preassembled units consisting of four elements. There are many types of bearings because of variations in the design of rings and separators and in the number of balls. They can be divided into classes according to their function: those that support a radial load, those that support a thrust load ,or those that support a combination of thrust and radial loads .The last type is termed “angular-contact bearings”.



Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）The rings and separator can be omitted and loose balls interposed between the shaft and the housing everywhere. （ ）

（2）This type of bearing is sometimes found in bicycles. （ ）

（3）They can be divided into classes according to their function. （ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

We can preassemble the vast majority of ball bearings into _____. For the _____ in the design of rings and separators and in the number of balls there are _____ bearings. They can be divided into classes according to_____: those that support a _____, those that support a _____ ,or those that support a _____and _____.

Work with your classmates trying to translate the following phrases into Chinese.

operating conditions	shaft	function	thrust
rings	housing	radial load	angular-contact bearings
separator	variations		

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）This type of bearing is sometimes found in bicycles.

（2）The vast majority of ball bearings, however, are preassembled units consisting of four elements.

（3）They can be divided into classes according to their function: those that support a radial load, those that support a thrust load ,or those that support a combination of thrust and radial loads .The last type is termed “angular-contact bearings”.

Survey your workplace and observe carefully, make out the importance of bearing in your workplace and then ask the master for help if any problems.

Survey your workplace again with your classmates and observe carefully, then write down the meaning of the following figures.



Figure 4-14_____



Figure 4-15_____

Practice spoken English.

Mr. Chen: Good morning,Mr. Cheng.

Mr. Cheng: Good morning, Mr. Chen

Mr. Chen : What are you doing?

Mr. Cheng: I an cleaning this ball bearing.

Mr. Chen: What are the essential parts of the ball bearing?

Mr. cheng: The essential parts of the ball bearing are the inner and outer ring, the balls and the separator.

Mr. Chen: Is the bearing standardized?

Mr. Cheng: Yes,it is.

Mr. Chen: How to assemble it ?

Mr. Cheng: The assembly of this consists of four stages.

Mr. Chen: Which are the four stages?

Mr. Cheng: The first, the inner ring is displaced within the outer, leaving a crescent shape space the second put the balls into the space the third moved the inner ring back tobe concentric the outer and spaced equally around the bearing the end installed a separator to maintain spacing of the balls.

Mr. Chen: Is deep-grooveball bearing the most widely used type of radial bearing?

Mr. Cheng: Yes, it is.

Mr. Chen: And why?

Mr. Cheng: Because although deep-groove ball bearings are designed to carry aradial load they perform well under a combined and thrust load.

Mr. Chen: You are very kind.

Mr. Cheng: Don’t mention it.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Eight　Chucks

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

jaw	爪
chuck	卡盘
hold	拿着，固定，夹持
center	中心，顶尖
design	设计
revolve	旋转
move	运动，移动
automatically	自动地
accuracy	精确性
accurate	正确的
accurately	正确地
wear	磨损
irregular	不规则的
irregularly	不规则地
adjust	调整
simultaneous	同时的
simultaneously	同时地
corrosive	侵蚀的

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

车床	磨损	旋转
侵蚀的	准确性	同时地
自动地	卡盘	爪

中心,顶尖　　不规则的　　拿着
三爪（万能）卡盘　　四爪（分动）卡盘　　或……或……

There are two types of jaw, i.e. The three-jaw universal and four-jaw independent types.

The three-jaw universal chuck , the chuck is used to hold cylindrical work. The chucking is done quickly, as the three jaws move in and out together and automatically center the work. This type of chuck is accurate when new.

The advantages of the three-jaw universal chuck are as follows:

（1）To hold cylindrical work.

（2）It is done quickly, as the three jaws move in and out together and automatically center the work.

（3）This type of chuck is accurate when new.

 Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）How many methods of chuck are there?

（2）What’s the purpose of designing them?

（3）How many advantages of the three-jaw universal chuck?

 Group activities. Work with your group members and read the above information again and try your best to solve the following problems.

Please list the advantages of the three-jaw universal chuck with the help of your workmates.

	the three-jaw universal chuck
advantage I	
advantage II	
advantage III	
advantage IV	

 Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）Work-pieces are held either between centers or in a chuck.



（2）Several types of chucks are available in metal machining.

（3）Its accuracy is not affected by wear, because each jaw can be adjusted independently.

Read the above underlined materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

work-pieces	chuck	center	available
metal machining	three-jaw universal	four-jaw	revolve
cylindrical	accuracy	adjusted	simultaneously

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

Several types of chucks are available in metal machining. The three-jaw universal and four-jaw independent types are most commonly used in lathe work. They are designed to hold and revolve the work-pieces.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）Only several types of chucks are available in metal machining. （ ）

（2）The chucking is done slowly, as the three jaws move in and out together and automatically center the work. （ ）

（3）This type of chuck is inaccurate when old. （ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

To hold work-pieces of _____ shapes, we often use a _____ chuck instead of a _____ chuck. Its accuracy is not affected by_____, because each jaw can be_____ independently. The jaws do not move_____.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

chuck	metal machining	lathe	hold
chuck in	in and out	accuracy	worn
irregular	adjusted		

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）The three-jaw universal and four-jaw independent types are most commonly used in lathe work.

（2）It loses its accuracy as the jaws become worn.

（3）Its accuracy is not affected by wear, because each jaw can be adjusted independently. The jaws do not move simultaneously.

Survey your workplace and observe carefully, make out the importance of chuck in your workplace and then ask the master for help if any problems.

Survey your workplace again with your classmates and observe carefully then write down the meaning of the following figures.



Figure 4-16_____



Figure 4-17_____

Practice spoken English.

Mr. Jack: Morning, Mr. Rose.

Mr. Rose: Morning, Mr. Jack.

Mr. Jack: Could you help me?

Mr. Rose: What can I do for you?

Mr. Jack: The three-jaw universal chuck does not work well, and I can't make it like before. Perhaps, you can fix it.

Mr. Rose: Let me try.(After a while)That's not too difficult to me.

Mr. Jack: What's wrong with it?

Mr. Rose: The jaws have been corrosive.
Mr. Jack: Oh, I see.
Mr. Rose: Now it works very well, but you must often oil it before using.
Mr. Jack: I know it now. Many thanks.
Mr. Rose: It's my pleasure.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Nine　Clutches

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

clutch	n. 离合器
disconnect	v. 断绝，使脱离
rotatable	a. 可旋转的
coaxial	a. 同（共）轴的，共心的
provide	v. 提供，供应，预备
convenient	a. 方便的，便利的
sufficient	a. 足够的
winding	n. 缠绕，弯曲
accelerate	v. 加速，促进
excessive	a. 过多的，过分的，额外的
restrict	v. 限制，约束
centrifugal	a. 离心的
actuate	v. 开动，激动，发动
predetermined	a. 预定的
imply	v. 暗示，包含
limiter	n. 限制器

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

离合器	旋转轴	同轴
输入轴	输出轴	驱动电动机
马达	转矩	负载轴
离心	扭矩	弹簧
摩擦离合器	限制值	

This is about the clutches features as follows.

A clutch is a device for quickly and easily connecting or disconnecting a rotatable shaft and a coaxial shaft. Clutches are usually placed between the input shaft to a machine and the output shaft from the driving motor, and provide a convenient means for starting and stopping the machine and permitting the driver motor or the engine to be started in an unloaded state.

The advantages of clutches are as follows:

（1）_____

（2）_____

（3）_____

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is a clutch?

（2）How to differ the rotor and torque?

（3）How about the friction clutch?

Work with your group members and read the above information again and try your best to solve the following problems.

Please list the advantages of clutch with the help of your workmates.

	clutch
advantage I	
advantage II	
advantage III	
advantage IV	



Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）Clutches are usually placed between the input shaft to a machine and the output shaft from the driving motor.

（2）A clutch between the motor and the load shafts will restrict the starting torque on the motor so that required to accelerate the rotor and parts of the clutch only.

（3）Torque-limiting clutches, as the name implies, release at a predetermined torque.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

rotatable shaft	coaxial shaft	input shaft	output sha
unloaded state	inertia	torque	self-actuating
overrunning	centrifugal clutches	torque-limiting	friction clutch

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

The rotor (rotating member) in an electric motor has rotational inertia, and a torque is required to bring it up to speed when the motor is started. If the motor shaft is rigidly connected to a load with a large rotational inertia, and the motor is started suddenly by closing a switch, the motor may not have sufficient torque capacity to bring the motor shaft up to speed before the windings in the motor are burned out by the excessive current demands.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）A torque is required to bring it down to speed when the motor is started. （ ）

（2）Centrifugal clutches are actuated by a mass that locks the clutch parts together at a predetermined speed. （ ）

（3）A clutch between the motor and the load shafts will restrict the starting torque on the motor so that required to accelerate the rotor and parts of the clutch only. （ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

The rotor (rotating member) in an electric motor has_____, and a torque is required to bring it up to _____ when the motor is started. If the motor shaft is rigidly connected to a load with a large _____ inertia, and the motor is started suddenly by_____, the motor may not have _____ torque capacity to bring the motor shaft up to speed before the windings in the motor are burned out by the _____ current demands.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

disconnecting	rigidly	capacity	demands
centrifugal	predetermined	ball-detent	by means of
excessive			

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）A clutch is a device for quickly and easily connecting or disconnecting a rotatable shaft and a coaxial shaft.

（2）The motor may not have sufficient torque capacity to bring the motor shaft up to speed before the windings in the motor are burned out by the excessive current demands.

（3）Torque-limiting clutches, as the name implies, release at a predetermined torque.

Survey your workplace and observe carefully, make out the importance of clutches in your workplace and then ask the master for help if any problems.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Then write down the meaning of the following figures. Give a topic to the following figure. Dictate the new words for each other among your group members.

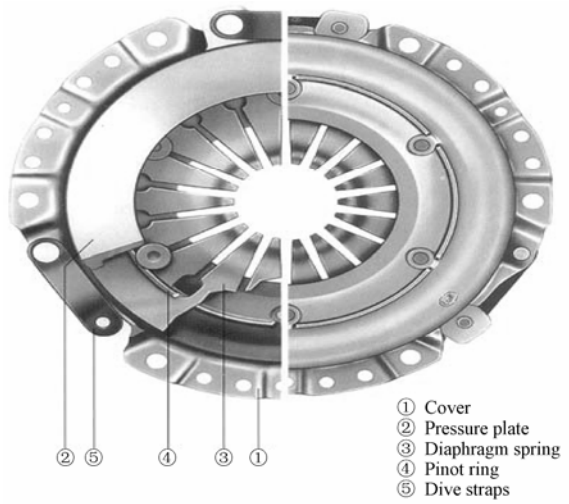


Figure 4-18_____

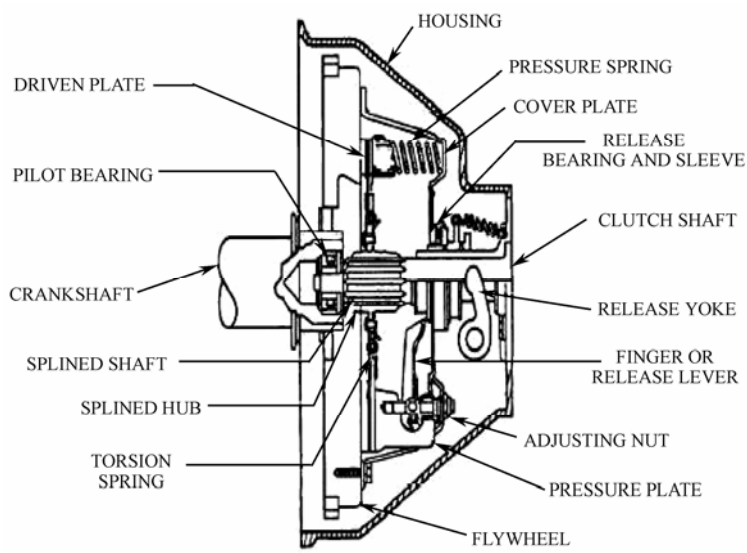


Figure 4-19_____

Practice spoken English.

Mr. Liu: Good afternoon, Mr. Xiong.

Mr. Xiong: Good afternoon, Mr. Liu.

Mr. Liu: I have some trouble with clutches. Could you tell me?

Mr. Xiong: What are the problems?

Mr. Liu: Do you know what the function of clutch is?

Mr. Xiong: Yes. I think I see. Clutch is …

Mr. Liu: What is the purpose of clutch?

Mr. Xiong: It can …

Mr. Liu: Thank you for telling me about these.

Mr. Xiong: Not at all.

 New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

 Scene Ten Shafts

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

 Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

component	元（零）件，分量，矢量
cylindrical	圆筒的，圆柱状的
rotate	（使）旋转，转动
receive	收到，接到（受）
via	经由，经过
coupling	联结，连接（轴）器
chain	链
inversely	相反地，倒转地
distort	歪曲，扭曲，使变形
strength	力量，强度
generally	一般地，通常地，大体上
torsional	扭力的，扭转的
static	静止的，静力的
fatigue	疲劳的
repeated	重复的，交变的

 The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

用，凭借	无疑地，很可能	被）规定为，（被）定义为
马车时代	（遭）受到	切应力
与……成正比例	容许（许用）切应力	除……之外
同时		



As a machine component a shaft is commonly a cylindrical bar that supports and rotates with devices for receiving and delivering rotary motion and torque . An axle is usually defined as a stationary cylindrical member on which wheels and pulleys can rotate, but the rotating shafts that drive the rear wheels of an automobile are also called axles, no doubt a carryover from horse-and-buggy days. Generally, shafts may be subjected to bending, tension, compression, or torsional loads, acting singly or in combination with one another.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）How many receiver or input does the camshaft have?

（2）What is axle?

（3）In addition to the shearing stress, what are twisted shafts also subjected to?

Work with your group members and read the above information again and try your best to solve the following problems.

Please list the items that shafts may be subject to with the help of your workmates.

	items
item Ⅰ	
item Ⅱ	
itemⅢ	
itemⅣ	

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）As a machine component a shaft is commonly a cylindrical bar that supports and rotates with devices for receiving and delivering rotary motion and torque.

（2）In operation, shafts are subjected to shearing stress.

（3）In designing a shaft, it is necessary to insure that, under any conditions, the shaft's maximum shearing stress must below (or at lest equal to) the allowed shearing stress.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

be proportional to	allowed shearing stress	at the same time	be suject to
in addition to	sharing stress	twist shaft	static stress

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

Generally, shafts may be subjected to bending, tension, compression, or torsional loads, acting singly or in combination with one another. When they are combined, one may expect to find both static and fatigue strength to be important in designing conditions, since a single shaft may be subjected to static stresses, completely reversed stresses, and repeated stresses, all acting at the same time.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）As a machine component a shaft is commonly a cylindrical bar that supports and rotates with devices for receiving and delivering rotary motion and torque . （ ）

（2）In designing a shaft, it is necessary to insure that, under any conditions, the shaft's maximum shearing stress must above (or at lest equal to) the allowed shearing stress. （ ）

（3）In addition to strength requirement ,shafts must be designed so that deflections are within acceptable limits. （ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

As a machine component a shaft is commonly a _____bar that supports and rotates with devices for receiving and delivering rotary motion and torque . An axle is usually defined as a stationary cylindrical member on which wheels and pulleys can _____, but the rotating shafts that drive the rear wheels of an automobile are also called axles, no doubt a carryover from horse-and-buggy days. Generally, shafts may be subjected to bending, tension, compression, or torsional loads, acting singly or in combination with one another. When they are _____, one may expect to find both static and _____ strength to be important in designing conditions, since a single shaft may be subjected to _____ stresses, completely reversed stresses, and repeated

stresses, all acting at the same time.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

shaft rotary motion valve-actuating mechanisms stationary cylindrical horse-and-buggy day tool-carrying shearing stress twisted shafts distorted state in combination with

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）The camshaft, driven by a gear or chain from the crankshaft, has only one receiver or input .

（2）An axle is usually defined as a stationary cylindrical member on which wheels and pulleys can rotate.

（3）The distorted state is usually defined by the angle of twist per unit length.

Survey your workplace and observe carefully, make out the importance of shaft in your workplace and then ask the master for help if any problems.

Survey your workplace again with your classmates and observe carefully, then write down the meaning of the following figures.



Figure 4-20_____



Figure 4-21_____

Practice spoken English.

Mr.Zhang: Hello,Mr.Cheng.Nice to see you again!

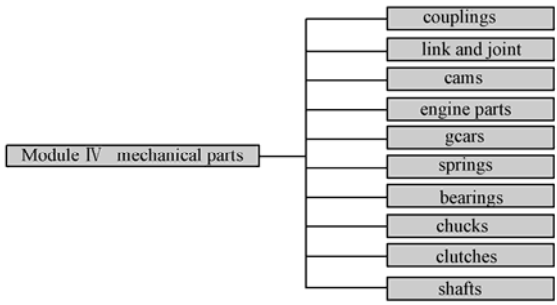
Mr.Cheng: I’m glad to meet you.

Mr.Zhang: What are you doing?

Mr.Cheng: I am preparing shafts.
Mr.Zhang: Oh,shafts? What does it mean?
Mr.Cheng: Shaft is …
Mr.Zhang: How can we decide the shaft?
Mr.Cheng: If the shaft is … and the machining quality is not satisfactory, the shaft must be …
Mr.Zhang: It seems difficult to …
Mr.Cheng: Don't worry.You can do your best if you work hard.
Mr.Zhang: You're very kind.
Mr.Cheng: That's OK.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Self assessments



Time_____ Class_____

No.	Name	Evaluation Items				Notes
		Attitude	Presentation& Passage	Exercises	Activities	

Teachers' Observation Record and Evaluation Sheet

item / level	listening	speaking	reading	writing	familiarity of parts
good					
better					
best					
bad					



Module V

Equipments in Manufacture

Guidance on teaching and learning

Teaching	VIP points	Master the equipments in manufacture
	Teaching methodology	Topic learning ,visual memorizing, group or one-centered learning, note-taking ,teamwork, presentation, questioning
	Nominal periods	16 periods
Learning	Learning methodology	In class: intensive and extensive reading ,sentence translation, Out of class: fast writing ,induction, deduction, self-evaluation
	Compulsory theoretic knowledge	Master the terms needed
	Learning procedures	Step 1 read the materials in pairs Step 2 discussion the learning materials with your partners Step 3 check the answers with the help of your group members and teachers Step 4 copy new words and expressions you don't know in this section



Scene One Lathe

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

driling	n. 钻削
miling	n. 铣削
fasten	v. 固定，加固，连接
feed	n. 进给，送给
cutter	n. 刀具
clamp	n. 夹子
carriage	n. 溜板
bed	n. 床
headstock	n. 主轴箱
tailstock	n. 尾架
slide	v. 滑动
metalwork	n. 金属制品
spindle	n. 主轴
wobble	v. 摇晃
alignment	n. 队列
micrometer	n. 千分尺

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

机床　　铣床　　刀座

主轴顶尖　　尾架顶尖

A lathe is a machine tool for cutting metal from the surface of a round work fastened between the two lathe centers and turning around its axis. In turning the work a cutter moves in the direction parallel to the axis of rotation of the work or at an angle to this axis, cutting off the metal from the surface of the work. This movement of the cutter is called the feed. The cutter is clamped in the surface of the tool post which is mounted on the carriage. The carriage is the mechanism feeding the cutter in the needed direction. The lathe hand may feed the cutter by hand or may make it be fed

automatically by means of special gears.

The largest part of the lathe is called the bed on which the headstock and the tailstock are fastened at opposite ends. On the upper part of the bed there are special ways upon which the carriage and the tailstock slide.

The two lathe centers are mounted in two spindles: one is held in the headstock spindle, while the other (the head center) is in the tailstock spindle.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）Where is the work piece fastened in a lathe?

（2）What is feed according to the passage?

（3）Where are the two lathe centers?

Work with your group members and read the above information again and try your best to solve the following problems.

Please list the construction of a lathe with the help of your workmates.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）A lathe is a machine tool for cutting metal fastened between the two lathe centers and turning around its axis.

（2）The cutter is clamped in the surface of the tool post which is mounted on the carriage.

（3）The largest part of the lathe is called the bed on which the headstock and the tailstock are fastened at opposite ends.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

lathe	round work	axis	turning the work
parallel to the axis	angle to this axis	cutter	feed
clamped	tool post	carriage	lathe hand





Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

The lathe chuck is used for chucking the work, which is used for clamping it so that it will rotate without wobbling while turning the chuck, usually, mounted on the headstock spindle may have different sizes and construction. If the work is perfectly round, it may be chucked in the so-called three-jaw universal chuck, all the jaws of which are moved to the center by turning the screw. But if the work is not perfectly round, the four-jaw independent chuck should be used.

In turning different materials and works of different diameters, lathes must be run at different speeds. The gearbox contained in the headstock makes it possible to run the lathe at various speeds.

Before turning a work the lathe, the lathe center is to be alined: that means that the axes of both centers must be on one line.

The alignment of the lathe centers may be tested by taking a cut and then measuring both ends of the cut with a micrometer.

Not all works should be fastened between the two centers of the lathe. A short work may be turned without using the dead center, by simply chucking it properly at the spindle of the headstock.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）The lathe chuck is used for chucking the work for rotation without wobbling while turning the chuck. （ ）

（2）All the jaws of three-jaw universal chuck are moved to the centre by turning the screw. （ ）

（3）The jaws of the four-jaw chuck are moved to the center by turning the screw independently. （ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

In turning _____ materials and works of _____ diameters, lathes must be run at _____ speeds .The gearbox contained in the headstock makes it possible to run the lathe _____ various speeds. Before turning a work, the lathe center is to be _____: that means that the axes of both centers must be on _____ line. The alignment of the lathe centers may be tested by taking a cut and then measuring both ends of the cut with a _____. Not _____ works should be fastened between the two centers of the lathe. A short work may

be turned _____ using the dead center, by simply chucking it properly at the spindle of the headstock.

 Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

lathe chuck	clamping	wobbling	turning the chuck
headstock spindle	construction	gearbox	short work
three-jaw universal chuck	four-jaw chuck	lathe center	dead center

 Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）The lathe chuck is used for chucking the work, which is for clamping it so that it will rotate without wobbling while turning the chuck.

（2）In turning different materials and works of different diameters, lathes must be run at different speeds.

（3）Not all works should be fastened between the two centers of the lathe.

 Survey your workplace and observe carefully, make out the importance of lathe in your workplace and then ask the master for help if any problems. Compare the differences of the chucks.

	three-jaw universal chuck	four-jaw chuck
definition		
applied parts		
advantages		
disadvantages		

 Survey your workplace again with your classmates and observe carefully, then write down the meaning of the following figures and translate relative Chinese words into English.

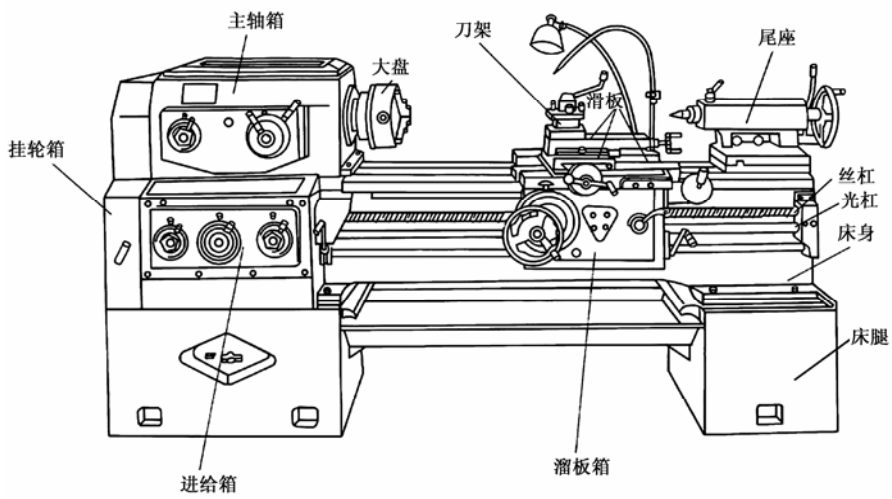


Figure 5-1_____

Practice spoken English.

Mr. Cook: Excuse me, may I ask you a question, Jay?
Jay: Of course.
Mr. Cook: Do you know about the structure of the lathe?
Jay: Yes, I know some of them.
Mr. Cook: What's that?
Jay: It's a headstock. Sometimes people call it as the heart of a lathe.
Mr. Cook: What's this then?
Jay: It's a chuck and a work-piece can be mounted on it.
Mr. Cook: What's that?
Jay: It's tool post and carriage. The cutting tools are put here.
Mr. Cook: What's that?
Jay: It's center and tailstock.
Mr. Cook: What's that?
Jay: It is a bed. These are all the main structure of the lathe. Are those clear to you?
Mr. Cook: Yes, you are very kind.
Jay: Delighted to have been of assistance.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.



Scene Two　Milling

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

remove	v. 旋转
mount	v. 固定
arbor	n. 心轴
spacer	n. 垫片
bushing	n. 衬套
yoke	n. 刀杆支架
slit	v. 切开
clockwise	a. 顺时针
regular	a. 规则的
particular	a. 特别的
horizontal	a. 水平的
various	a. 不同点
variation	n. 变化
knee	n. 升降台
universal	a. 万能的
elevate	v. 升高
index	n. 分度头
stock	n. 台

The following expressions we may use , before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

装有	分类为	分成
根据	从……出去	虎钳
装置	横向的	

The milling machine is a machine that removes metal from the work with a revolving milling cutter as the work is fed against it, the milling cutter is mounted on an arbor where it is held in place by spacers or bushings, the arbor is fixed in the spindle with one end, while the other end of

the arbor rotates in the bearing mounted on the arbor yoke.

The milling cutters are generally made from high speed steel and available in different sizes and shapes. there are such kinds of milling cutters as cylindrical cutters, end milling cutters(for face milling), form milling cutters, angular cutters, side and face cutters, skate ting saw, etc. these cutters may differ in the direction of their operation i.e. they may cut revolving either clockwise or counter-clockwise.

Regular or irregular shaped work may be produced on a milling machine. Designs varying according to the particular class of work wanted. According to the position of the spindle, the milling machines may be divided into two groups of vertical spindle milling machines and horizontal spindle milling machines. Milling machines may be grouped into various classes.

According to variation in general design as the "column and knee type", the manufacturing types, and the planer type of milling machine. According to the table design, the milling machines may be classified as universal and plain milling machines.

 Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）How many kinds of milling cutters?

（23 What is the milling machine?

（4）How many kinds of milling machines according to general design?

（5）How many kinds of milling machines according to the position of the spindle?

 Work with your group members and read the above information again and try your best to solve the following problems.

Write down the types of milling machines according to different criterion.

general design	
position of the spindle	
table design	

 Read the above materials again with your workmates and then discuss with your colleagues and fill in the following table about the types of milling cutters. Tick it out if it is.

cylindrical cutters （ ） end milling cutters （ ） side and face cutters （ ）

form milling cutters （ ） angular cutters （ ） slitting saw （ ）

Survey your workplace again with your classmates and observe carefully then write down the meaning of the following figures. Dictate the new terminologies for each other among your group members.

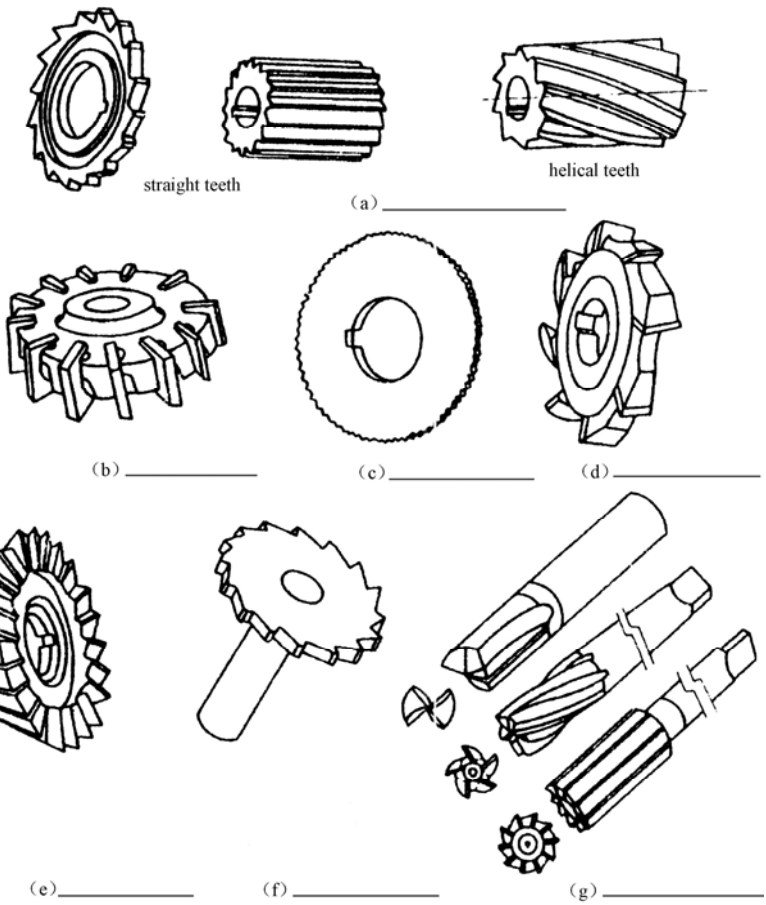


Figure 5-2_____

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）The milling cutter is mounted on an arbor where it is held in place by spacers or bushings.

（2）The milling cutters are generally made from high speed steel and available in different sizes and shapes.

（3）Designs varying according to the particular class of work wanted.





Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

According to the _____ of the spindle, the milling machines may be divided into _____ groups of vertical spindle milling machines and _____ spindle milling machines. Milling machines may be grouped into various _____.

According to variation in general _____ as the "column and knee type", the _____ types, and the _____ type of milling machine. According to the _____ design, the milling machines may be classified as universal and _____ milling machines.

Read through the above information again with your workmates and try to put them into the relative place about the types of milling machines, put them into different classification.

① vertical spindle milling machines ② universal milling machines
③ plain milling machines ④ the planer type of milling machine
⑤ horizontal spindle milling machines ⑥ the manufacturing types
⑦ column and knee type

General design

Position of the spindle

Table design

The most impartment parts of the milling machine are starting levers, spindle, column, knee, elevating screw, table, index head, speed levers, feed levers, table movement levers, foot stock, and arbor yoke.

The spindle of the milling machine is driven by an electric motor through a train of gears mounted in the column. The table of the plain milling machine may travel only at right angles to the spindle, while the universal milling machine is provided with a table that may be swiveled on the transverse slide for milling gear teeth, threads etc.

Various attachments are used for increasing the range of work that can be performed on a milling machine.

The dividing head (also called an index head) is a device used to divide the periphery of a piece work into any number of equal parts, and to hold the work in the required position while the cuts are being made.

Various kinds of vises may be used for holding the work in a milling machine, the most common being the plain vise, and the swivel vise.



Read the above materials again with your workmates and then try to translate the following phrases into Chinese, and finally discuss with your workmates.

starting levers	spindle	column	knee
elevating screw	table	index head	speed levers
feed levers	table movement levers	foot stock	arbor yoke

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）The spindle of the milling machine is driven by an electric motor through a train of gears mounted in the column.

（2）Various attachments are used for increasing the range of work.

（3）The dividing head is a device used to divide the periphery of a piece work into any number of equal parts.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）The table of the plain milling machine may travel only at right angles to the spindle.（　　）

（2）The table of universal milling machine may be swiveled on the transverse skatede.（　　）

（3）The plain vise and the swivel vise are common vise in milling machine.（　　）

Survey your workplace and observe carefully, make out the importance of milling machines in your workplace and then ask the master for help if any problems, write down your experiences in your workplace.

Read through the above information again with your workmates and then tick out the following items which belong to the parts of a milling machine.

starting levers	（　　）	column	（　　）
elevating screw	（　　）	index head	（　　）
feed levers	（　　）	foot stock	（　　）

spindle	()	table	()
table movement levers	()	knee	()
speed levers	()	arbor yoke	()

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

Various attachments are used for increasing the _____ of work that can be performed on a _____ machine. The dividing head (also called an _____) is a device used to divide the periphery of a piece work into any number of _____ parts, and to hold the work in the _____ position while the cuts are being made. Various kinds of _____ may be used for holding the work in a milling machine, the most common being the _____ vise, and the _____ vise.

Survey your workplace again with your classmates and observe carefully, then write down the meaning of the following figures.

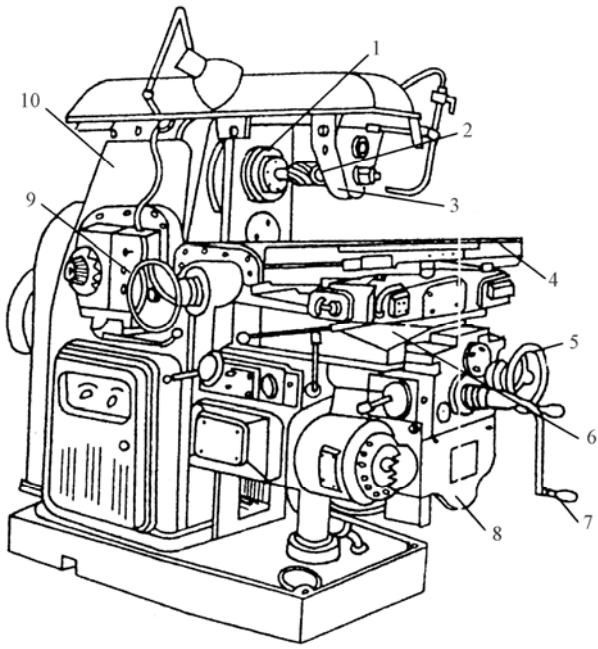


Figure 5-3_____

Survey your workplace again with your classmates and observe carefully, then write down the meaning of the following figures. Dictate the new terminologies for each other among your group members.

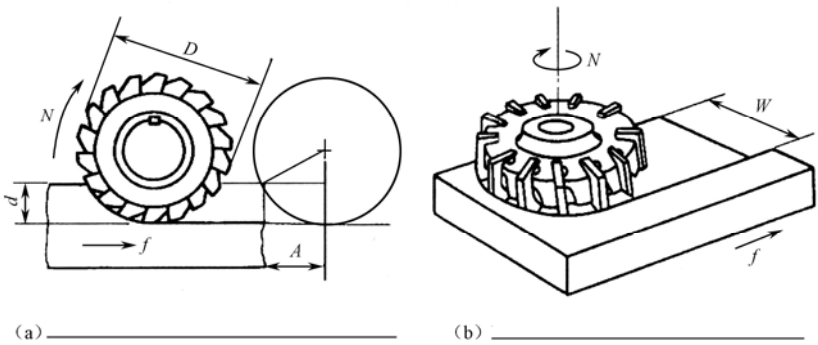


Figure 5-4_____

Practice spoken English.

Jay: How do you do! My name is Jay.
Miss Kate: How do you do!
Jay: Are there any vacancies in your factory?
Miss Kate: Yes. We need some new workers. What subject was your major?
Jay: I majored in mechanical manufacturing, and I think I am good at operating milling machine.
Miss Kate: What sort of job do you want to do?
Jay: I would like to be a milling worker. I think I can do my best to it.
Miss Kate: Great! What time can you start to work?
Jay: Anytime.
Miss Kate: Very nice. How much do you expect in salary?
Jay: 700 yuan.
Miss Kate: OK! Please fill in this form. If anything turns, I'll contact with you.
Jay: Thank you!
Miss Kate: You're welcome.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Three　Machine Center

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.





Look at the following words we may use in this scene and try to make out their Chinese meaning in a given time, whoever finishes off it first will be the winner.

original random potential

machining center holding fixture

Now look at the following Chinese meaning with your colleagues carefully and try your best to make out their English meaning in pairs, finally dictate them for each other among your team workers.

adj. 任意的，随便的 adj. 最初的，原始的 n. 夹具

n. 加工中心 n. 潜能，潜力

The flexibility and versatility of numerical control have led to the development of a new type of machine tool called the machining center, which can use simpler work holding fixtures and fewer cutting tools.

We provide an automatic tool changer for the machining center. The tool change arm located above the spindle rotates clockwise, simultaneously gripping the tool in the spindle and another tool in an interchange station located on the face of the machine which is used to store the tool temporarily. The arm then moves forward, removing the tools from the spindle and from the interchange station. After rotating clockwise 180 degrees, the arm retracts, inserts the new tool in the spindle, and places the used tool in the interchange system. The arm then returns to the original position. A mechanical hand inside the drum removes the tool from the interchange station and stores it in the tool drum. The mechanical hand removes the next tool to be used from the drum and stores it in the tool drum .The mechanical hand removes the next operation. The tool change operation may be completed in 5 seconds. The tool drum can hold a large number of different tools.Each tool holder being coded, the tools can be selected in a random order and in any sequence.

The potential of these machines can be fully realized with the help of NC.

Read the above underlined materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）We provide an automatic tool changer for the machining center.

（2）The arm then moves forward, removing the tools from the spindle and from the interchange station.



（3）The arm retracts, inserts the new tool in the spindle, and places the used tool in the interchange system.

（4）A mechanical hand inside the drum removes the tool from the interchange station and stores it in the tool drum.

（5）Each tool holder being coded, the tools can be selected in a random order and in any sequence.

 Read the above materials first with your colleagues and then try your best to give out the definition of machine center.

 Work with your group members and read the above information again, then describe the process of tool change.

 Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What does the tool change arm first do in the spindle and in an interchange station?

（2）What is located on the face of the machine and is used to store the tool temporarily?

（3）What does the arm do next from the spindle and from the interchange station?

（4）Can the tools be selected in a random order and in any sequence?

 Work with your group members and read the above information again and try your best to translate the following terms into Chinese.

in a random order	tool holder	tool drum
NC	mechanical hand	machining center
automatic tool changer	in the spindle	in any sequence
rotating clockwise	moves forward	new tool
used tool	interchange station	

Survey your workplace and observe carefully, make out the process of tool change and ask the master for help if any problems, write down your experiences in your workplace.

Survey your workplace with your team mates and watch the operation panel of CNC machines carefully and then finish off the following tasks.

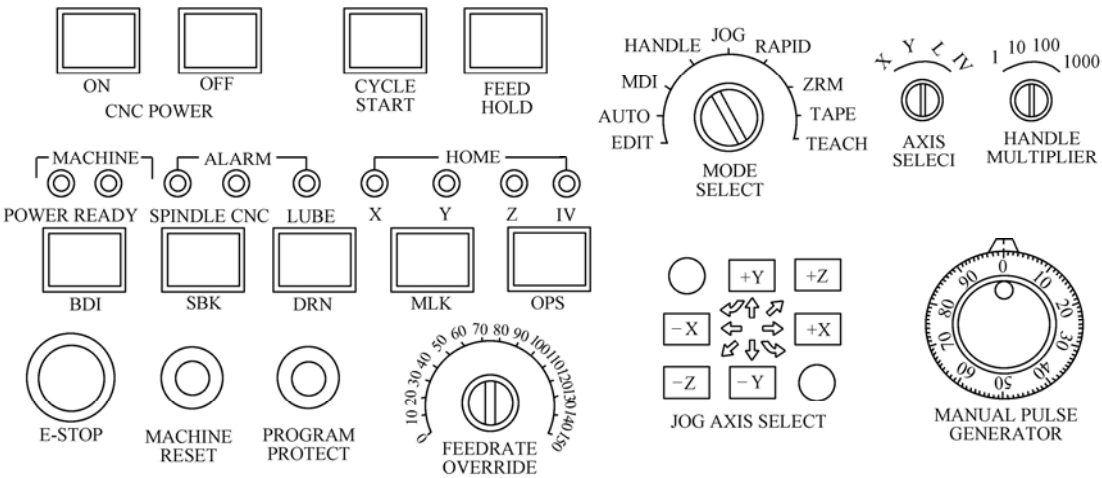


Figure 5-5_____

① CONTROL PANEL
② POWER ON/OFF
③ RESET
④ MDI
⑤ HANDLE
⑥ JOG
⑦ CYCLE START
⑧ RAPID TRAVERSE OVERRIDE
⑨ MACHINE LOCK
⑩ FEED HOLD
⑪ SINGLE BLOCK
⑫ DRY RUN
⑬ CRT CHARACTER DISPLAY
⑭ DISPLAY
⑮ EMERGENCY STOP
⑯ MODE SELECT
⑰ EDIT
⑱ MEMORY
⑲ REFERENCE RETUR
⑳ FEED RATE OVERRIDE

（ ）The contents of the currently active program are active sequence number display.

（ ）The screen is on which all the characters(addresses)and data are shown.

（ ）This button is used for alarming cancellation or cancellation of an operation.

（ ）The control is always turned on after the main power switch, located on the door of the control system.

（ ）Usually, the control panel is located at the front of the main electronic system and is equipped with a screen and with various buttons and switches.

（ ）This switch is used to check a new program on the machine. All movements of the tool are blocked, while a check is run on the computer screen.

（　　）This switch reduces the rapid feed rate.

（　　）This allows the control of the work feeds defined by function F. You can increase or decrease the percentage of the value entered in the program.

（　　）Turning this switch ON and then pressing button X,Y or Z causes the machine to return to the zero position for each axis.

（　　）By turning this switch ON, all the rapid and work feeds are changed to one.

（　　）This switch can also be used if you intended to check the performance of a new program on the machine or if the momentary interruption of a machine's work is necessary.

（　　）The control lamp located above the button goes on , and the control lamp located above CTCLE START goes off .

（　　）Use this button during the execution of the program from MEMORY or when the CYCLE START button is pressed, the control lamp located above this button goes on.

（　　）This mode allows the selection of manual monotonous to feed along the X, Y, and Z axes .

（　　）Allows for the manual control of the movements of the table with the use of the hand wheel, along one of four axes;　X Y, Z or B.

（　　）This mode enables the automatic control of the machine.

（　　）This mode enables the NC to command the memory to be executed.

（　　）This mode enables you to :Enter the program to machine memory, Enter any changes to the program, Transfer data from the program to a tape, Check the memory storage capacity.

（　　）Use this switch to specify the operational mod.

（　　）This button is red and is located in the lower left corner of the control panel.



There are two main types of maching centres: the horizontal spindle and the vertical spindle machine. Please give out the names for the following figures.



（a）_____



（b）_____

Figure 5-6_____

Learn the following materials with your colleagues and then do your best to fill in the blanks with the help of your partners.

In a CNC system, each _____ of motion is equipped with a separate driving source that replaces the hand wheel of the conventional machine. The driving source can be _____ motor, a _____, or a _____. The source selected is _____ mainly based on the precision requirements of the machine.

Survey your workplace with your classmates carefully and then try to fill in the blanks in the following figures with the help of your partners, finally do your best to memorize the terms in the figure.

The main components of CNC machining centres are the bed, saddle, column, table, servomotors, ball screws, spindle, tool changer, and the machine control unit.



Figure 5-7_____

Observe your workplace with your colleagues the different kinds of machine center and the components of a CNC machine center and then try your best to finish off the following tasks: task 1, fill in the blanks in the following figures; task 2, remember them with the help of your group members, then dictate them for each other.

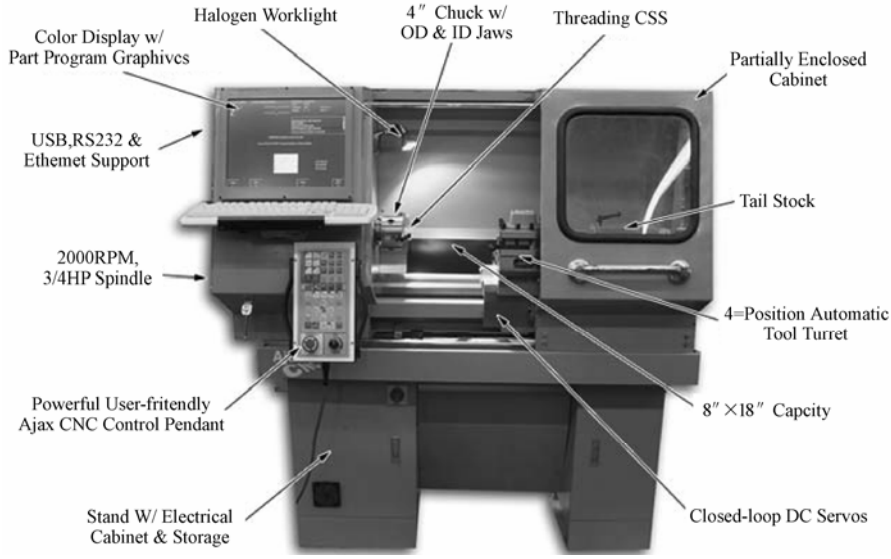


Figure 5-8

Practice spoken English.

Mr. Zhang: Hello, Mr. Cheng.

Mr. Cheng: Hi, Mr. Zhang.

Mr. Zhang: I want to know some knowledge of the CAD. Could you tell me some about it?

Mr. Cheng: No problem. What do you want to know?

Mr. Zhang: What does the CAD mean?

Mr. Cheng: Computer aided design (CAD) means the use of a computer to assist in the design of an individual part or a system. The design process usually involves computer graphics.

Mr. Zhang: What is the CAD system?

Mr. Cheng: It is basically a design tool in which the computer is used to analyze aspects of a designed product.

Mr.Zhang: What can the CAD system support?

Mr.Cheng: It can support the design process at all levels conceptual, preliminary, and final design.

Mr. Zhang: Can the designer test the product by the CAD system?

Mr. Cheng: Yes. It can do.

Mr. Zhang: What is one of the most valuable features of CAD systems?

Mr. Cheng: The display of the designed object on a screen.

Mr. Zhang: What systems are the most CAD systems using?

Mr. Cheng: Interactive graphics systems.

Mr. Zhang: Do you think the elimination of hidden lines is one of the most difficult problems in CAD drawings?

Mr. Cheng: Yes, I think so.

Mr. Zhang: Oh. I have learned so much from you. Thanks a million.

Mr. Cheng: At your service.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Four The Planer

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

contour	n. 轮廓 v. 仿形
straight	adj. 直的
rail	n. 铁轨
housing	n. 套
rigidity	n. 刚性，硬度
former	adj. 从前的
formerly	adv. 以前
latter	adj. 后面的
angular	adj. 有角的
narrow	adj. 狭窄的
reference	n. 参考
subsequent	adj. 后来的
subsequently	adv. 其后

The following expressions we may use , before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or surfing the internet.

前者	斜面	后者
基准面	单立柱龙门刨床	双立柱龙门刨床
直线切割	仿形面	



The planer is one of the biggest machine tools that employ a reciprocating cutting action. It generates flat or contoured surfaces in a series of straight cuts. Its efficiency is higher than that of the shaper.

The work on the planer is held on the machine table and moves under the tool which is carried on the rail. The bed must be approximately twice as long as the table to support it at all positions during the stroke. The double-housing planer has two housings to support the rail at each end. The open-side planer has the housing on one side only. Open-side planers are designed for work-pieces which are so wide that they can pass between the housings of double-housing planers. The double-housing machine however, offers greater rigidity.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What are the biggest machine tools in a reciprocating cutting action?

（2）Under what condition open-side planers can be employed?

（3）Why the bed must be approximately twice as long as the table?

Work with your group members and read the above information again and try your best to solve the following problems.

Please compare the following terms.

The planer	The shaper
The double-housing planer	**The open-side planer**

Read the above materials again with your workmates and then discuss with your colleagues, finally fill in the following table about the characteristics of the planer. Tick it out if it is.

one of the biggest machine tools	（ ）	flat surfaces	（ ）
higher efficiency	（ ）	reciprocating cutting action	（ ）
contoured surfaces	（ ）	tool on the rail	（ ）
The bed twice longer	（ ）	housings	（ ）

Survey your workplace again with your classmates and observe carefully then write

down your experiences.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

（1）The bed must be approximately twice as long as the table to support it at all positions during the stroke.

（2）Open-side planers are designed for work-pieces which are so wide that they can pass between the housings of double-housing planers.

（3）The double-housing planer has two housings to support the rail at each end.

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

The work on the _____ is held on the machine table and moves under the tool which is carried on the _____. The bed must be approximately twice as long as the table to support it at all positions during the _____. The double-housing planer has two housings to support the rail at each end. The open-side _____ has the housing on one side only. Open-side planers are designed for work-pieces which are so wide that they can _____ between the housings of double-housing planers. The double-housing machine however, offers greater _____.

Read through the above information again with your workmates and try to put them in the relative place about the planer, put them into corresponding place.

① two housings　② one housing

③ to support the rail at each end　④ work-pieces so wide

⑤ greater rigidity

The double-housing planer

The open-side planer

Some of the work that was formerly done on the planer is now done on the planer-type milling machine since the former is not as efficient as the latter. However, there are still many jobs that can be carried out better and more economically on the planer than on any other machines. Angular surfaces are often easier to machine on the planer. Planning is also most effective in the

machining of long and narrow surfaces. In addition, the planer usually takes the important first cut on the rough forging or casting to establish a reference surface for subsequent machining.

Read the above materials again with your workmates and then try to translate the following phrases into Chinese, and finally discuss with your workmates.

the planer	planer-type milling machine	carried out	economically
angular surfaces	long and narrow surfaces	rough forging	casting
reference surface	first cut		

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）Many jobs can be carried out better and more economically on the planer.

（2）Long and narrow surfaces can be machined on planning effectively.

（3）The planer usually takes the important first cut on the rough forging or casting.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）Some of the work can be done on both the planer and the planer-type milling machine. （ ）

（2）The planer can work on angular long and narrow surfaces easily and effectively. （ ）

（3）A reference surface can be established through first cut on the planer. （ ）

Survey your workplace and observe carefully, make out the importance of the planer in your workplace and then ask the master for help if any problems, write down your experiences in your workplace.

Read through the above information again with your workmates and then tick out which the following items belong to the advantages of the planer.

economically	（ ）	better	（ ）
angular surfaces	（ ）	long and narrow surfaces	（ ）
establish a reference surface	（ ）		





Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

Some of the work that was _____ done on the planer is now done on the planer-type milling machine since the _____ is not as efficient as the _____. However, there are still many jobs that can be carried out better and more _____ on the planer than on any other machines. Angular surfaces are often easier to machine on the _____. Planning is also most effective in the machining of long and narrow _____. In addition, the planer usually takes the important _____ cut on the rough forging or casting to establish a reference _____ for subsequent machining.

Practice spoken English.

Mr. Wang: Hello, Mr. Ding, what are you doing?
Mr. Ding: I am machining a part on the planer!
Mr. Wang: This is a planer, isn't it ?
Mr. Ding: Yes. It is a planer.
Mr. Wang: What can it do?
Mr. Ding: Cylindrical parts, hole, and end surface can be made on it.
Mr. Wang: What's that?
Mr. Ding: It is a milling machine.
Mr. Wang: Is this a milling cutter?
Mr. Ding: Yes, it is. It is a end milling cutter.
Mr. Wang: What kinds of work can it to?
Mr. Ding: It can produce plane, slot and cam surface.
Mr. Wang: Thank you for your help.
Mr. Ding: My pleasure.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.



Scene Five Shaping and Planning Operating

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.



Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

shaper	n. 牛头刨床
planer	n. 龙门刨床
equation	n. 等式，方程式
manipulation	n. 操作，操纵
reciprocate	v.（使）往复运动，前后转动
stroke	n. 敲，打击，行程
clamp	v. 施加压力，夹住，加紧　n. 夹子，夹钳
obsolete	a. 陈旧的，作废的
alternating	n. 交替的，轮流的
fixture	n. 固定，设备
inclined	a. 倾斜
swivel	n. 旋转，转体，v. 使旋转，给……装上旋转

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

用，凭借	空闲时间	减少，除去
虽然，反之	比率	相同的，同样的，均匀的

Planning, shaping and slotting are processes for machining horizontal, vertical, and inclined flat surfaces, slots, or grooves by means of a lathe-type cutting tool. In these processes, the cutting action takes place along a straight line. In planning, the work piece (and the machine bed) is reciprocated, and the tool is fed across the work piece to reproduce another straight line, thus generating a flat surface. In shaping and slotting, the cutting tool is reciprocated and the work piece is fed normal to the direction of tool motion. The difference between the latter two processes is that in shaping, the tool path is horizontal. It is vertical in slotting. Shapers and slitters can be employed in cutting external and internal keyways, gear racks dovetails, T-slots, and the like. In fact, shapers and planers have virtually become obsolete, as most of planning and shaping operations have been replaced by more productive processes such as milling, broaching, or abrasive machining. The use of shapers and planers is now limited to the machining of large beds of machine tools and the like.

In all these three processes, there are successive alternating cutting and idle return strokes. The cutting speed is, therefore, the speed of the tool (or the work piece) in the direction of cutting during the varying stroke. The cutting speed may be either constant throughout the working stroke or variable, depending upon the design of the shaper or planer. We now discuss the construction and operation of the most common types of shapers and planers.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What do the work piece and the tool act in planning?

（2）What is planning, shaping and slotting?

（3）What do the cutting tool and work piece act in shaping and slotting?

（4）Why shapers and planers is limited to the machining of large beds of machine tools?

Work with your group members and read the above information again and try your best to solve the following problems.

Please list the action of the tool and work piece.

	planning	shaping	slotting
cutting tool			
work piece			

Read the above materials again with your workmates and then try to translate the following sentences about the function of planning and shaping into Chinese, and finally discuss with your workmates.

（1）Planning, shaping and slotting are processes for machining horizontal, vertical, and inclined flat surfaces, slots, or grooves by means of a lathe-type cutting tool.

（2）In planning, the work piece (and the machine bed) is reciprocated, and the tool is fed across the work piece to reproduce another straight line.

（3）In shaping and slotting, the cutting tool is reciprocated and the work piece is fed normal to the direction of tool motion.

Work with your classmates trying to translate the following phrases into Chinese.

planning	shaping	slotting	grooves
horizontal surfaces	vertical surfaces	slots	inclined flat surfaces



straight line

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

In all these three processes, there are _____ alternating cutting and _____ return strokes. The cutting speed is, therefore, the speed of the _____ (or the work piece) in the direction of cutting during the varying _____. The cutting speed may be either _____ throughout the working stroke or variable, depending _____ the design of the shaper or planer. We now discuss the construction and operation of the most _____ types of shapers and planers.

This type of machine tool consists of frame that houses the speed gearbox and the quick-return mechanism, which transmits power from the motor to the ram and the table. The ram travel is the primary motion that produces a straight-line cut in the working stroke, whereas the intermittent cross travel of the table is responsible for the cross feed. The tool head is mounted at the front end of the ram and carries the clapper box tool to rise during the idle return stroke in order not to ruin the newly machined surface. The tool head can be swiveled to enable machining inclined surfaces.

The work piece can either be bolted directly to the machine table or held in a vise or any other suitable fixture. The cross feed of the table is generated by a ratchet and pawl mechanism, which is driven through the quick-return mechanism (i.e., the crank and slotted arm).The machine table can be raised or lowered by means of a power screw and a crank handle. It can also be swiveled in universal shaper.

The quick-return mechanism involves a rotating crank that is driven at a uniform angular speed and an oscillating slotted arm that is driven at uniform angular speed and an oscillating slotted arm that is connected to the crank by a sliding block. The working stroke takes up an angle (of the crank revolution) that is larger than that of the return stroke. Since the angular speed of the crank is constant, it is obvious that the time taken by the idle return stroke is less than that taken by the cutting stroke. In fact, it is the main function of the quick-return mechanism to reduce the idle time during the machining operation to a minimum.

Now, let us consider the average speed of the tool during the cutting stroke. It can be determined as a function of the length of the stroke and the number of strokes per minute as follows:

Average cutting speed S=2LN/C

N=the number of strokes per minute

L=the length of stroke

C=the cutting time ratio

It is obvious that the total number of stroke required to machine a given surface by the equation:

N=W/F

W=the total width of work piece

F=the cross feed

Therefore the machining time is T=2LN/SC

So the rate of the metal removal can be M.R.R. =TFLN（in3/min）

 Read the above materials carefully with your roommates and then try to give a topic to it.

 Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）The speed gearbox and the quick-return mechanism transmits power from the motor to the ram and the table. （ ）

（2）The intermittent cross travel of the table is responsible for the cross feed. （ ）

（3）The tool head can be swiveled to enable machining inclined surfaces. （ ）

 Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

The work piece can _____ be bolted directly to the machine table _____ held in a vise or any other suitable fixture. The _____ feed of the table is generated by a _____ and pawl mechanism, which is driven through the quick-return mechanism (i.e., the crank and slotted arm) .The machine _____ can be raised or lowered by means _____ a power screw and a crank handle. It can also be _____ in universal shaper.

 Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

speed gearbox	motor	primary motion	cross feed
quick-return mechanism	ram	ram travel	clapper box tool
intermittent cross travel	rotating crank	working stroke	return stroke
oscillating slotted arm	cutting stroke	idle return stroke	


Read the above materials again and then do your best make out the Chinese meaning of the following sentences with the help of your teammates.

（1）The quick-return mechanism involves a rotating crank and an oscillating slotted arm.

（2）The working stroke takes up an angle (of the crank revolution) that is larger than that of the return stroke.

（3）The time taken by the idle return stroke is less than that taken by the cutting stroke.


Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is the function of frame?

（2）What is the function of the ram travel?

（3）What is the function of the intermittent cross travel?

（4）What is the function of the tool head?


Read the above materials carefully with your roommates and then try to give out the meaning of the following formulas.

S=2LN/C　　N=W/F　　T=2LN/SC　　M.R.R. =TFLN（in3/min）

N=

L=

C=

W=

F=

M.R.R.=


Survey your workplace and observe carefully, make out the importance of Horizontal Push-cut shapers in your workplace and then ask the master for help if any problems.


The vertical shaper is similar in construction and operation to the push-cut shaper, the difference being that the ram and the tool head travel vertically instead of horizontally. Also, in this

type of shapers, the work piece is mounted on a round table, which can have a rotary feed whenever desired to allow machining of curved surfaces, e.g., spiral grooves. Vertical shapers, which are sometimes referred to as slitters, are used in internal cutting. Another type of vertical shapers is known as a keys eater because it is specially designed for cutting keyways in gears, cams, pulleys, and the like.

Read the above material carefully with your roommates and then try to give a topic to it.

Please list the differences between the vertical shaper and the push-cut shaper.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）Where does the work piece mount in the vertical shaper?

（2）Are vertical shapers sometimes used in internal cutting?

（3）What is the function of the keys eater?

A planer is a machine tool that does the same work as the horizontal shaper but on work pieces that are much larger than those machined on shapers. Although the designs of planers vary, most common are the double-housing and open-side construction. In a double-housing planer, two vertical housings are mounted at the sides of the long heavy bed. A cross rail, which is supported at the top of these housings, carries the cutting tools. The machine table (while in operation) reciprocates along the guide-ways of the bed and has T-slots in its upper surface for clamping the work piece. In this type of planer, the table is powered by a variable-speed motor through a gear drive. The cross rail is powered by a variable-speed motor through a gear drive. The cross rail can be raised or lowered as required, and the inclination of the tools can be adjusted as well. In an open-side planer, there is only one upright housing at one side of the bed. This latter construction provides more flexibility when work pieces are to be machined.

Read the above materials carefully with your roommates and then try to give a topic to it.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.



Tick the correct response in the relevant box.

（1）The planer work on much larger work piece than those machined on shapers. （ ）

（2）Most common planers are the double-housing and open-side construction. （ ）

（3）The machine table (while in operation) reciprocates along the guide-ways of the bed and has T-slots in its upper surface for clamping the work piece. （ ）

（4）The cross rail can be raised or lowered as required, and the inclination of the tools can be adjusted as well. （ ）

（5）An open-side planer provides more flexibility when work pieces are to be machined. （ ）

Planning and Shaping tools

Planning and shaping processes employ single-point tools of the lathe type, though heavier in construction. They are made of either high-speed steel or carbon tool steel with carbide tips. In the latter case, the machine tool should be equipped with an automatic lifting device to keep the tool from rubbing the work piece during the return stroke, thus eliminating the possibility of the carbide tips.

The cutting angles for those tools depend upon the purpose for which the tool is to be used and the material being cut. The end relief angle does not usually exceed 4° ,whereas the side relief varies between 6° and 14° . The side rake angle also varies between 5° (for cast iron)and 15° (for medium carbon steel).

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

planning processes	carbide tips	return stroke	high-speed steel
shaping processes	cutting angles	end relief angle	carbon tool steel
single-point tools	cast iron	side rake angle	medium carbon steel

Read the above materials again and then do your best to make out the Chinese meaning of the following sentences with the help of your teammates.

（1）They are made of either high-speed steel or carbon tool steel with carbide tips.

（2）Automatic lifting device eliminate the possibility of the carbide tips.

（3）The cutting angles for those tools depend upon the purpose for which the tool is to be used and the material being cut.

（4）The side rake angle also varies between 5° and 15°.

 Read the above materials carefully with your romemates and then try to give a topic to it.

 Survey your workplace and observe carefully, make out the importance of the planner in your workplace and then ask the master for help if any problems.

 Practice spoken English.

Miss Li: Hi, Mr. Yang.

Mr.Yang: Hi, Miss Li, how are you?

Miss Li: I am fine, thank you. But I have some problem with the shaping and planning, could you give me a favor?

Mr.Yang: Yes, It's my pleasure. What are these problems?

Miss Li: What can shaper and planer do?

Mr.Yang: The shaper and planer are generally used for machining flat surfaces, which are usually preformed by a cutter that set the chip from the work.

Miss Li: What are the shape and planer's motion forms?

Mr. Yang: The main motion is reciprocating and the feed aims at the direction of the main motion.

Miss Li: Are the shaper and planer used in mass production?

Mr. Yang: No.

Miss Li: Why?

Mr.Yang: Because they are rather slow in operation.

Miss Li: But, for mass production, what methods should we use?

Mr. Yang: Milling machines and grinders are more widely used for producing flat surfaces in mass production.

Miss Li: What structures are there on a typical shaper?

Mr.Yang: There are tool head, ram, column, table, rocker mechanism, etc.

Miss Li: How is the feed obtained on a shaper?

Mr.Yang: The feed is obtained by a pawl which engages in a notched wheel or ratchet.

Miss Li: I am really appreciated you for telling me this knowledge.

Mr.Yang: I was glad to be of some services.

 New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.



Scene Six　Drilling Machines

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning.

efficient	adj. 有效率的
principle	adj. 主要的
body	n. 体
shank	n. 钻柄
point	n. 点，刀尖
flute	n. 凹槽
spiral	adj. 螺旋形的
rake	n. 前角
lip	n. 刀刃
chip	n. 碎削
curl	v. 使卷曲
channel	n. 通道
lubricant	n. 润滑剂
margin	n. 便捷
lessen	v. 减少
socket	n. 插口
tang	n. 柄舌
sensitive	adj. 敏感的
tapping	n. 穿孔
threading	n. 螺纹

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

锪端面	钻体间隙
螺旋槽	镗孔
平底锪钻	尖底锪钻

The twist drill is a very efficient tool. It is generally formed by forging and twisting grooves in a flat strip of steel or by milling a cylindrical piece of steel, high-speed steel being commonly used. High-speed steel costs more but tools made of it withstand heat much better than those made of ordinary tool steel.

The twist drill may be divided into three principal parts: body, shank, and point. The flutes are the spiral grooves that are formed on the side of a drill, drills being made with two, three or four flutes, those having three or four flutes are used for following smaller drills or for enlarging holes already drilled, and are not suited for drilling into solid stock.

Spiral flutes have four main advantages:

（1）They give the correct rake to the lip of a drill.

（2）They cause the chip to curl so tightly that it occupies the minimum amount of space.

（3）They form channels through which chips escape from the hole.

（4）They allow the lubricant to flow easily down to cutting edge.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is the twist drill?

（2）Why the twist drill is made by high-speed steel?

（3）What are the parts of the twist drill?

Tick out which of the following items are belong to the parts of twist drill after reading the above materials and discussing with your workmates.

body	（ ）	shank	（ ）
point	（ ）	flutes	（ ）

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please write down the advantages of spiral flutes.

the advantages of spiral flutes	I	
	II	
	III	

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Then write down the meaning of the following figures. Give a topic to the figure.Dictate the new words for each other among your group members.

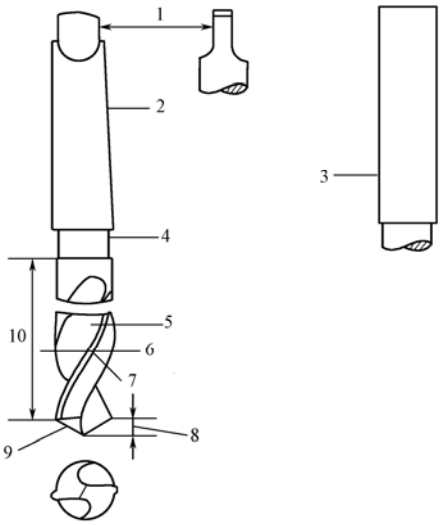


Figure 5-9_____

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）The twist drill is formed by forging and twisting grooves in a flat strip of steel or by milling a cylindrical piece of steel. （ ）

（2）The flutes are the spiral grooves that are formed on the side of a drill, drills being made with two, three or four flutes. （ ）

（3）They form channels through which chips escape from the hole. （ ）

The margin is the narrow strip on the cutting edge of the flute. It is practically the full diameter of the drill and extends the entire length of the flute, its surface being a part of a cylinder. The portion of the body next to the margin is of fewer diameters than the margin. This lessened diameter, called body clearance, reduces the friction between the drills and the walls of the hole while the margin insures the hole being of accurate size.

The shank is the end of the drill which fits into the socket, spindle, or chuck of the drill press. The tang is usually found only on tapered shank tools.

The drilling machine is the second oldest machine tools, having been invented shortly after the lathe. And it is one of the most common and useful machines. The drilling machines may be

classified into three general types: vertical spindle, multiple spindle, and radial spindle machine. The vertical spindle drilling machine comes in three types: heavy duty, plain, and sensitive.

Besides the drilling of holes, such operations may be performed on the drilling machine: drilling, tapping (internal threading), reaming (finishing the hole with a reamer), countersinking, counter boring, boring and spot-facing.

Read the above materials again with your workmates and then try to translate them into Chinese with the help of your workmates, and then dictate for each other among your partners.

the margin	the flute
the drill	body clearance
the shank	chuck of the drill press

First translate the following sentences about drilling machine with your cooperators.

（1）The margin is the narrow strip on the cutting edge of the flute.

（2）Body clearance, reduces the friction between the drills and the walls of the hole.

（3）The drilling machine is one of the most common and useful machines.

Read through the above information again with your workmates and try to fill in the blanks in the following short passage. Dictate the words and expressions for each other among your roommates.

The drilling machine is the _____ oldest machine tools, having been invented shortly after the _____. And it is one of the most common and useful machines. The drilling machines may be classified _____ three general types: _____ spindle, _____ spindle, and _____ spindle machine. The vertical spindle drilling machine comes in _____ types: heavy duty, plain, and sensitive.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is the function of body clearance?

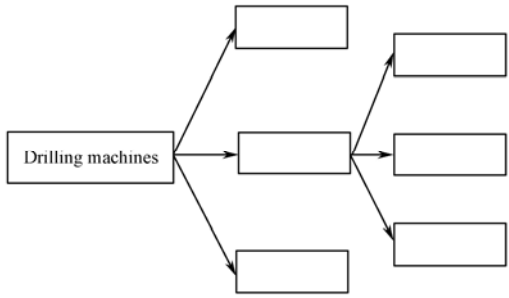
（2）What is the function of the margin?

（3）How many types of drilling machines?

Tick out which of the following items are belong to the operations and may be performed on the drilling machine after reading the above materials and discussing with your workmates.

drilling	（ ）	tapping	（ ）
reaming	（ ）	countersinking	（ ）
counter boring	（ ）	boring	（ ）
spot-facing	（ ）		

Please fill in the forms about the types about drilling machines.



Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

Practice spoken English.

Yang: Good morning, teacher Rong.
Teacher Rong: Good morning, Yang.
Yang: What are you doing?
Teacher Rong: I am drilling a hole in this work-piece.
Yang: What's this?
Teacher Rong: It is a drilling machine.
Yang: What can we do with the drilling machine?
Teacher Rong: It can be used for machining holes.
Yang: Is the twist drill a very efficient tool?
Teacher Rong: Yes, it is.
Yang: What material is the twist drill generally made of?
Teacher Rong: It is usually made of high-speed steal.
Yang: How many parts may the twist drill be divided into?





Teacher Rong: It may be divided into three principal parts: body, shank and point.

Yang: Could you tell me about the history of drilling machine.

Teacher Rong: Of course, the drilling machine is the second oldest machine, having been invented shortly after the lathe, and is one of the most common and useful machine.

Yang: Oh, I see, thank you, teacher Rong. Bye-bye.

Teacher Rong: Bye!



New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.



Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.



Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

radial	adj. 半径的
radially	adv. 沿径向
handle	n. 把手
arm	n. 臂
circle	n. 圆
control	n. 控制
select	vt. 选择
selector	n. 选择器
lever	n. 杠杆
engage	n. 接合
deal	vt. 量



The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or surfing the internet.

摇臂钻床　　摇臂　　选速手柄

大量的



The radial drilling machine is designed for handling large work-pieces that cannot be easily moved. The drilling machine head is mounted on a heavy radial arm which may be from three to twelve or more feet long. This arm can be raised or lowered with power and can be turned in a

complete circle around the column. The drilling head moves back and forth along this arm. On most radial drilling machines, movement of the arm, drill head, and spindle is controlled by power.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is the radial drilling machine designed for?

（2）Where is the drilling machine head mounted?

（3）What controlled the movement of the arm, drill head, and spindle?

Work with your group members and read the above information again and try your best to solve the following problems.

Please write down the function of the radial drilling machine.

Read the above materials again with your workmates and then try to translate the following sentences about the function of radial drilling machine into Chinese, and finally discuss with your workmates.

（1）The radial drilling machine is designed for handling large work-pieces that cannot be easily moved.

（2）The drilling head moves back and forth along this arm.

（3）This arm can be raised or lowered with power and can be turned in a complete circle around the column.

Work with your classmates trying to translate the following phrases into Chinese.

the radial drilling machine	the drilling machine head
a heavy radial arm	raised or lowered with power
moves back and forth	movement of the arm, drill head, and spindle

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

Spindle feeds and speeds are controlled by selector levers which engage the proper gears in the drill head. Depth of feed is also controlled directly in the drill head by a suitable mechanism. In addition to drills, other tools such as reamers and boring heads can also be used, these tools add a great deal of versatility to this machine.

Work with your classmates trying to translate the following phrases into English.

进给量和转速	选速手柄
主轴箱	齿轮
进给深度	适当的机构
钻头	刀具
绞刀	镗头

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）Spindle feeds and speeds are controlled by selector levers which engage the proper gears in the drill head. （ ）

（2）Depth of feed is also controlled directly in the drill head by a suitable mechanism.（ ）

（3）the jaws of the four-jaw chuck are moved to the center by turning the screw independently. （ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

Spindle feeds and speeds are controlled by selector _____ which engage the proper gears in the drill head. Depth of _____ is also controlled directly in the drill head by a _____ mechanism. In addition to drills, other tools such as _____ and _____ can also be used; these tools add a great deal of _____ to this machine.

Survey your workplace and observe carefully, make out the importance of radial drilling machines in your workplace and then ask the master for help if any problems.

Practice spoken English.

Mr. Sun: How do you do?Welcome to visit our products.What kinds of equipment are you most interested in?

Mr. Li: I am interested in your radial drilling machines.Would you give me a manual of Model XK 5025?

Mr. Sun: OK, may I know your name,please?

Mr. Li: Yes, here is my calling card.

Mr. Sun: This is my card.Thank you for coming.

Mr. Li: Would you like to introduce this kind of radial drilling machine?

Mr. Sun: No problem.Established in 1960,our company has a long history and abundant experience in radial drilling machine. We are highly praised by customers because of high quality of our products and our excellent after-sales services. Our products are widely sold in the world.

Mr. Sun: Would you give me your quotation?

Mr. Sun:Let me think over, 120 000RMB.

Mr. Li: Oh,your quotation in on the high side. I would like to visit other company and then talk the price with you. See you later.

Mr. Sun: Hope to see you again.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Seven　Grinding Machines

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning.

conical	adj. 圆锥的
surplus	n. 过剩
exterior	adj. 外面的
taper	n. 锥形
sharpen	vt. 使锐利
substitute	n. 代替者
base	n. 床身
concentricity	n. 同轴度
periphery	n. 圆柱表面
infeed	n. 横向进给
interior	adj. 内部的

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

单人车刀
横向磨削
圆柱孔
圆柱体外表面
内圆磨床
无心磨床
工具磨床
余量
成形磨削
内圆磨头
万能磨床
横向全面进给磨削
平面磨床
外圆磨床
磨床

A grinding machine is a machine which employs a grinding wheel for producing cylindrical, conical or plane surfaces accurately and economically and to the proper shape, size, and finish. The surplus stock is removed by feeding the work against the revolving wheel or by forcing the revolving wheel against the work.

There is a great variety of grinding machine. The machines that are generally used are cutter grinder, surface grinder, center less grinder, external grinder, internal grinder, and tool grinder. These machines are usually classified as to size by the largest piece of work which they can be completely machined (as 6*18 inch external grinder).

Five types of grinding operations are performed on grinding machines:

（1）Cylindrical grinding. Exterior cylinders and tapers are ground on plain grinding machines and on center less grinders.

The construction of universal grinding machines is similar to that of plain grinders. They are equipped with an internal grinding attachment, however, no that they can do both cylindrical and internal grinding.

（2）Internal grinding. Interior cylinders and tapers are ground on internal grinding machines and on center less grinders.

（3）Surface grinding. Plane surface are ground on several types of surface-grinding machines.

（4）Tool and cutter grinding. Reamers, milling cutters and other tools are sharpened on tool and cutter grinding machines.

（5）Form grinding. Some machine tools such as thread, and gear grinders are designed especially for form grinding.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Then write down the meaning of the following figures. Give each of the following figures a topic. Dictate the new words for each other

among your group members.

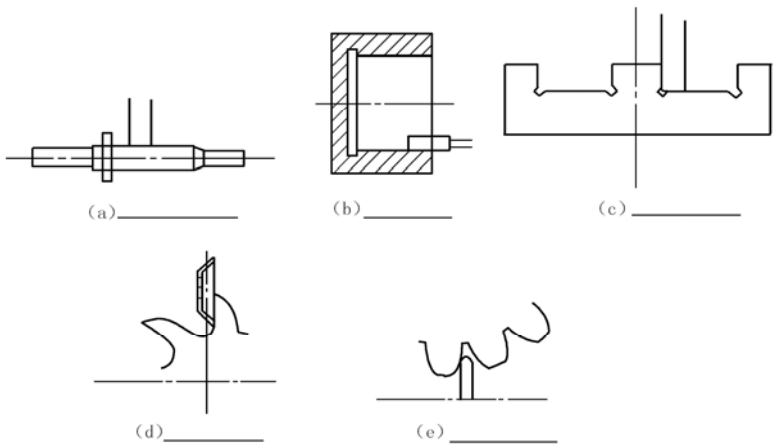


Figure 5-10_____

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is grinding machine?

（2）How many types of grinding machine?

（3）How many grinding operations are performed on grinding machines?

Read through the above information again with your workmates and try to fill in the blanks in the following short passage. Dictate the words and expressions for each other among your roommates.

A grinding _____ is a machine which employs a grinding _____ for producing cylindrical, conical or plane _____ accurately and economically and to the _____ shape, size, and finish. The surplus stock is removed by feeding the work against the revolving wheel or by forcing the revolving wheel _____ the work.

There is a great variety _____ grinding machine. The machines that are generally used are _____ grinder, _____ grinder, _____ grinder, _____ grinder, _____ grinder, and _____ grinder. These machines are usually classified as to _____ by the largest piece of work which they can be completely machined.

Read the above materials again with your workmates and then try to translate the following sentences about grinding machine into Chinese, and finally discuss with your workmates.





（1）Exterior cylinders and tapers are ground on plain grinding machines and on center less grinders.

（2）Interior cylinders and tapers are ground on internal grinding machines and on center less grinders.

（3）Reamers, milling cutters and other tools are sharpened on tool and cutter grinding machines.

 Read the following materials carefully and then decide which of the definition belong to the corresponding place.

（1）cylindrical grinding （2）internal grinding （3）surface grinding
（4）tool and cutter grinding （5）form grinding

（ ） Reamers, milling cutters and other tools are sharpened on tool and cutter grinding machines.

（ ） Exterior cylinders and tapers are ground on plain grinding machines and on center less grinders.

（ ） Some machine tools such as thread, and gear grinders are designed especially for form grinding.

（ ） Interior cylinders and tapers are ground on internal grinding machines and on center less grinders.

（ ） Plane surface are ground on several types of surface-grinding machines.

 Principal parts of a plain grinding machine are as follows:

（1）Base. The main casting of a plain grinding machine is a base that rests on the floor.

（2）Tables. A sliding table, which is mounted on ways at the front and top of the base, may be moved longitudinally by hand or power to feed work-pieces past the face of the grinding wheel. If the centerline of the swivel table is set at an angle, a taper will be ground.

（3）Headstock and tailstock. A motor-driver headstock and a tailstock are mounted on the left and right ends, respectively, of the swivel table for holding work-pieces on centers. The headstock center on a grinder is a dead center that is both centers are “dead” to insure concentricity of the periphery of groundwork with its axis.

（4）Wheel head .a wheel head that carries a grinding wheel and its driving motor is mounted on a slider at the top and rear of the base. The wheel head may be moved perpendicularly to the table ways by hand or power, to feed the wheel to the work.

Either of two methods may be used to grind cylinders and tapers on plain grinding machines. In traverse-cut grinding, the work-piece is fed longitudinally past the face of the grinding wheel, and the wheel is fed toward the work after each reversal of the table until the piece is finished to

size. The in feed at each reversal should be from 0.001 to 0.005 inch for roughing, and from 0.0005 to 0.0025 inch for finishing. in plunge-cut grinding, a grinding wheel that has a face width equal to or slightly longer than the surfaces being ground is employed and is fed transversely until the work-piece has the required diameter. No longitudinal feeding motion is used.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Then write down the meaning of the following figures. Give a topic to the following figure. Dictate the new words for each other among your group members.

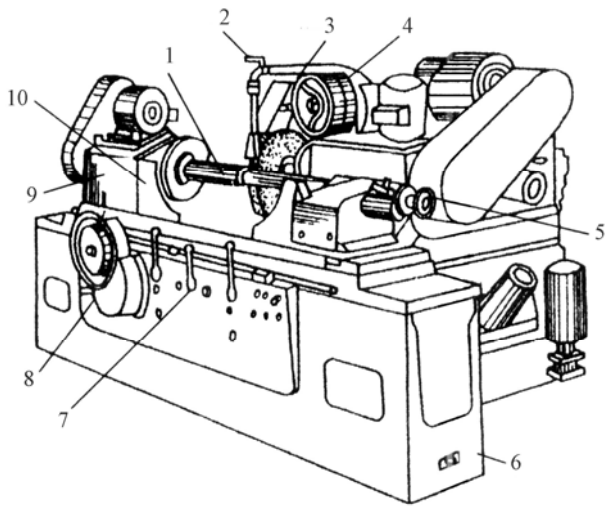


Figure 5-11_____

The following expressions we may use, before we finish off the task, please make out their Chinese meaning with the help of your teammates or dictionary or the internet.

plain grinding machine	base
tables	headstock and tailstock
wheel head	sliding table
grinding wheel	swivel table
centers	traverse-cut grinding
roughing	

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace. Please talk about the principal parts of a plain grinding machine and then filling in the following blanks.

parts of a plain grinding machine	base	
	tables	
	headstock and tailstock	
	wheel head	

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

Translate the following sentences about a plain grinding machine with your cooperators.

（1）A plain grinding machine is essentially a lathe on which a grinding wheel has been substituted for the single-point tool.

（2）The main casting of a plain grinding machine is a base that rests on the floor.

（3）No longitudinal feeding motion is used.

（4）Either of two methods may be used to grind cylinders and tapers on plain grinding machines.

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the advantages of hydraulic machine tool drive.

（1）There are roughly four parts of a plain grinding machine. （ ）

（2）A lathe is somewhat like a plain grinding machine. （ ）

（3）The headstock centres are both “dead” centres. （ ）

（4）If the center line of the swivel table is set at an angle, a taper will be ground. （ ）

Survey your workplace and observe carefully, make out the importance of grinding machines in your workplace and then ask the master for help if any problems, write down your



experiences in your workplace.

 Look at the following words we may use in this scene and match the English and Chinese meaning.

grinder	磨床
capable	有能力的
swivel	旋转
degree	程度
line	线
footstock	尾架
dog	挡块
rapid	迅速的，快的
rapidly	快，迅速地
rate	率，比率，速度
oppositely	在对面，相反的
direction	方向
contact	接触，触点
capable of	能……的，可以……的
center line	中心线
at the rate of	按……速率（比率）
in opposite direction	朝相反方向
in the direction of…	朝……方向
rpm=revolution per minute	转/分

Plain center-type cylindrical grinder is used to grind the outside of cylindrical parts. The table that is fastened to the bed of this machine is capable of back-and-forth (reciprocating) movement and can also be swiveled about 10 degrees on either side of the center line. Both the headstock and the footstock are mounted on this table. The grinding wheel is mounted on a spindle. It can be moved to and from the work-piece.

Both the grinding wheel and the work-piece rotate during the machining operations. The grinding wheel turns rapidly-825 to 1250 rpm. The work piece turns a much slower rate-100 to 400 rpm. The surfaces of the grinding wheel and the work piece move in opposite directions at their line of contact. The table is used to move the work-piece across the front of the wheel.

 Give a topic to the above materials.

Practice spoken English.

Miss Jone: Hello, Mr.Christer, nice to meet you!

Mr. Christer: Hi Miss jone, nice to meet you, too.

Miss Jone: What are you doing?

Mr. Christer: I am checking the grinding machines.

Miss Jone: I know your major is engineering. Could you tell me how many kinds of grinding machines there are in common use?

Mr. Christer: There are …

Miss Jone: What are they?

Mr. Christer: They are …

Miss Jone: How do the grinding machines work?

Mr. Christer: Well, …

Miss Jone: I'm really very grateful to you .

Mr. Christer: Not at all.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Scene Eight Machine Tools and Aggregate Machine Tools

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

lathe	车床
drill	钻床
mill	铣床，铣刀
ream	铰孔
tap	攻丝螺纹
thread	螺纹，线
turn	车削
cylindrical	圆柱（体，形）的



blank	毛坯，坯料
pulley	皮带轮
bore	镗孔
enlarge	扩大
finish	精加工，粗糙度
shaper	牛头刨床
planer	龙门刨床
slot	缝，狭槽
reciprocate	来回往复运动
stroke	冲程，行程
abrasive	摩擦（损）的

The following expressions we may use, before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

单刃刀具　　与……有关系　　连接于，固定于

来回，往复　　包含，包括，由……组成　　精度　　微粒

Machine tools are machines for cutting metals. The most important of machine tools used in industry are lathes, drilling machines and milling machines. Other kinds of metal working machines are not so widely used in machining metals as these three.

The lathe is commonly called the father of the entire machine tool family. For turning operations, the lathe uses a single point cutting tool, which removes mental as it travels past the revolving work-piece. Turning operations are required to make many different cylindrical shapes, such as axes, gear blanks, pulleys, and threaded shafts. Boring operations are performed to enlarge, finish, and accurately locate holes.

Drilling is performed with a rotating tool called a drill. Most drilling in metal is done with a twist drill. The machine used for drilling is called a drill press. Operations, such as reaming and tapping, are also classified as drilling. Reaming consists of removing a small amount of metal from a hole already drilled.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What are machine tools?

（2）What are the common machine tools used in industry?

（3）What cylindrical shapes can be machined by turning operations?

Work with your group members and read the above information again and try your best to solve the following problems.

Please write down the function of drilling.

Read the above materials again with your workmates and then try to translate them into Chinese, and finally discuss with your workmates.

machine tools	lathes
drilling machines	milling machines
turning operations	axes
gear blanks	pulleys
threaded shafts	boring operations
reaming	tapping

First translate the following sentences about machine tools with your cooperators.

（1）Reaming consists of removing a small amount of metal from a hole already drilled.

（2）Boring operations are performed to enlarge, finish, and accurately locate holes.

（3）The machine used for drilling is called a drill press.

Survey your workplace and observe carefully, and then ask the master for help if any problems, write down your experiences in your workplace.

Tapping is the process of cutting a thread inside a hole, so that a cap screw or bolt may be threaded into it.

Milling removes metal with a revolving, multiple cutting edge tools called milling cutter. Milling cutters are made in many styles and sizes. Some have as few as two cutting edges and others have 30 or more. Milling can produce flat, angled surfaces, groves, slots, gear teeth, and other profiles, depending on the shape of cutters being used.

Shaping and planing produce flat surfaces with a single point cutting tool. In shaping, the cutting tool on a shaper reciprocates or moves back and forth while the work is fed automatically towards the tool. In planing, the work-piece is attached to a worktable that reciprocates past the cutting tool. The cutting tool is automatically fed into the work-piece a small amount on each



stroke.

Grinding makes use of abrasive particles to do the cutting. Grinding operations may be classified as precision or non-precision, depending on the purpose. Precision grinding is concerned with grinding to close tolerances and very smooth finish. Non-precision grinding involves the removal of mental where accuracy is not important.

Work with your classmates trying to translate the following phrases into English.

攻丝螺纹	铣削
铣刀	切削刃
牛头刨床	龙门刨床
进给	磨削
沟槽	齿轮轮齿

Discuss with your colleagues and try to share the ideas of your partners and then make sure which of the following expression is right or wrong. Right for T and wrong for F.

Tick the correct response in the relevant box.

（1）Tapping is the process of cutting a thread inside a hole, so that a cap screw or bolt may be threaded into it. （ ）

（2）Milling removes metal with a revolving, multiple cutting edge tools called milling cutter. （ ）

（3）Shaping and planing produce flat surfaces with a single point cutting tool. （ ）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

_____ makes use of abrasive particles to do the cutting. Grinding operations may be classified as precision or _____, depending on the purpose. Precision grinding is concerned with grinding to _____ and very smooth finish. Non-precision grinding involves the removal of mental where _____ is not important.

Survey your workplace and observe carefully, make out the importance of machine tools in your workplace and then ask the master for help if any problems.

Solve the following problems in groups.

（1）Tick out the items milling cutters can machine.

flat surfaces	（ ）	groves	（ ）	gear teeth	（ ）
angled surfaces	（ ）	slots	（ ）	other profiles	（ ）

（2）Compare the differences between shaping and planing.

	shaping	planing
cutting tools		
Work piece		
worktable		

（3）Compare the types of grinding.

Grinding makes use of abrasive particles to do the cutting. Grinding operations may be classified as precision or non-precision, depending on the purpose. Precision grinding is concerned with grinding to close tolerances and very smooth finish. Non-precision grinding involves the removal of mental where accuracy is not important.

precision grinding	non-precision grinding

Look at the following words we may use in this scene and match the English and Chinese meaning in a given time, whoever finishes off it first will be the winner.

aggregate	组合的
aggregation	聚集，集合体
standard	标准
well	好
appearance	出现
branch	分支
factory	工厂
instance	例子
plant	工厂
numerical	数字的
numerically	用数字的
productivity	生产率

The following expressions we may use , before we finish off the task, please make out their English meaning with the help of your teammates or dictionary or the internet.

在……方面得到使用　　借助于



机械制造业　　例如
在五十年代　　首次出现
以及，和……一样　　同样
组合机床

An aggregate machine tool is a highly efficient automatic. It is an aggregation of standard components, such as power transmission units, rotary tables, milling heads, beds, columns as well as some special components.

The aggregate machine tool made its first appearance in the fifties, but it has rapidly developed into a very important branch of the machine tool industry. Many factories are designing and making various aggregate machine tools to increase their production.

A plant has successfully designed and built a numerically controlled aggregate machine, which employs twenty three power transmission units with two hundred and seventeen spindles. With the help of this machine, the productivity of this plant is raised by fourteen times.

Aggregate machine tools are increasing in number and variety. They have found wide application in our machine building industry.

Read the paragraph of the above materials and do your best to answer the following questions with the help of your classmates.

（1）What is an aggregate machine tool?

（2）What is the function of aggregate machine tools?

（3）What about the application of aggregate machine tools?

Work with your group members and read the above information again and try your best to solve the following problems.

Tick out the parts of aggregate machine tools.

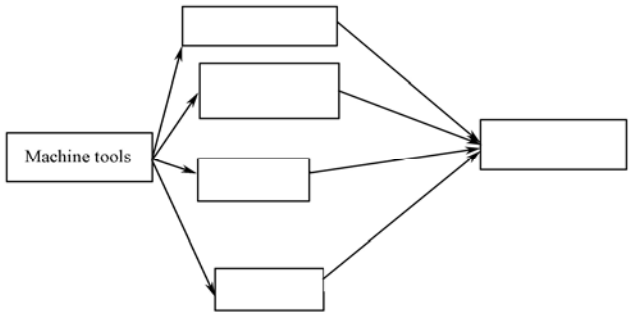
power transmission units	（　）	rotary tables	（　）	milling heads	（　）
some special components	（　）	columns	（　）	beds	（　）

Read through the above information again with your workmates and try to fill in the blanks in the following short passage.

An aggregate machine tool is a highly efficient _____. It is an aggregation of standard components; the typical parts include _____ units, _____, milling _____, beds, _____ as well as some special _____. It has rapidly developed into a very

important _____ of the machine tool industry. Many factories are designing and making various aggregate machine tools to _____ their production. A plant has successfully designed and built a numerically controlled _____ machine, the productivity of this plant is raised _____ fourteen times with the help of this machine.

Work with your workmates and try to make out general types of machines. Fill in the following schematic illustration.



The following expressions we may use, before we finish off the task, please make out their Chinese meaning with the help of your teammates or dictionary or the internet.

aggregate machine tool	rotary tables	milling heads	beds
power transmission units	columns	spindles	production
machine building industry	number and variety		

Practice spoken English.

Mr.Wang: Good morning,Mr Cliton.

Mr.Cliton: Good morning,Mr Wang.

Mr.Wang: What are you doing?

Mr.Cliton: I am studying machine tools.

Mr.Wang: What's this?

Mr.Cliton: It is an aggregate machine tools.

Mr.Wang: What can it do?

Mr.Cliton: We can use it to …

Mr.Wang: Is the aggregate machine tools one of the machine tools?

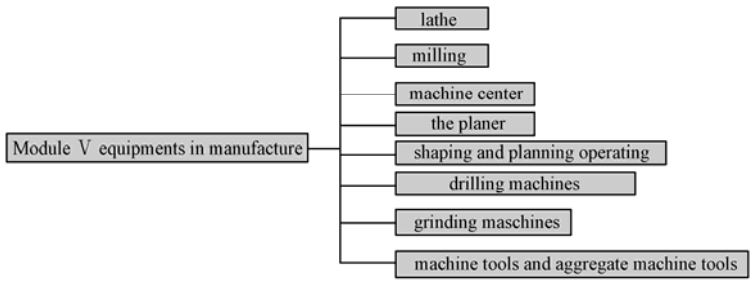
Mr.Cliton: Yes, in fact there are many kinds of machine tools and they can also be used for producing things.

Mr.Wang: It's very kind of you.

Mr.Cliton: That's all right.

New words and expressions we learn（let the students copy the new words and expressions he or she doesn't know in this scene and then dictate them among his/her group members）.

Self assessments



Time_____ Class_____

No.	Name	Evaluation Items				Notes
		Attitude	Presentation& Passage	Exercises	Activities	

Teachers' Observation Record and Evaluation Sheet

item / level	listening	speaking	reading	writing	familiarity of parts
good					
better					
best					
bad					



Module VI

Mechanical Workplace Communication

Guidance on teaching and learning

Teaching	VIP points	Master the necessary mechanical applied writing
	Teaching methodology	Topic learning ,visual memorizing, group or one-centered learning, note-taking ,teamwork, presentation, questioning
	Nominal periods	16 periods
Learning	Learning methodology	In class: intensive and extensive reading ,sentence translation, Out of class: fast writing ,induction, deduction, self-evaluation
	Compulsory theoretic knowledge	Master the terms needed
	Learning procedures	Step 1 read the materials in pairs Step 2 discussion the learning materials with your partners Step 3 check the answers with the help of your group members and teachers Step 4 copy new words and expressions you don't know in this section



Scene One　Notice of Invitation for Bids

招标通告通常由以下几部分组成：

（1）标题（Headline）。

（2）招标单位名称（Name of Tendering Unit）。

（3）工程名称（Name of the Project）。

（4）工程招标号（Bid of Number）。

（5）正文（Body Copy）。

（6）附项（Supplementary Items）。

Specimen1

The People's Republic of China
China International Tendering Company
China National Technical Import & Export Corporation
Notice of Prequalification
Inland Waterway Project
Civil Works of Dayuandu Junction of Xiangjiang
Navigation Construction Project
(Hengyang-Zhuzhou)
Bid No.ITC-952002

The Government of the People's Republic of China(P.R. China)has applied for a loan from the World Bank in various currencies towards the cost of China Inland Waterway Project and it is intended that part of the loan will be applied to eligible payments under the civil works of Dayuandu Junction Xiangjiang Navigation Construction Project(Hengyang-Zhuzhou).

China International Tendering Company(hereinafter referred to as ITC)authorized by Hunan Xiangjiang Navigation Construction & Development Corporation Ltd.(hereinafter referred to as Employer)now invites applications for prequalification from eligible potential bidders for furnishing the necessary labor, material, equipment , and services for the construction and completion of Dayuandu Junction of Xiangjiang River (Hengyang-Zhuzhou).

Contract A: Civil Works of Dam & Power Station Housing
Contract B: Civil Works of Ship Lock Engineering

Interested eligible potential bidders may obtain further information and prequalification documents from the office of ITC whose addresses are shown below , between 9:00 and 11:00 am,2:00 and 4:00 pm (Beijing Time) from Jan.28 to Mar.14,1995(except holidays) upon a nonrefundable payment of RMB2340 for each set of the documents. For mail order ,an extra RMB300(domestic) or US$40(overseas) postage shall be added for special courier service.

(Account No .of ITC in the Bank of China , Beijing Head Office : 40143042.)

Completed applications for prequalification in one original plus four copies must be delivered to Hunan Xiangjiang Navigation Construction & Development Corporation Ltd.(Address:105 Yan Jiang Road , Changsha , Post code: 410005) at or before 16:00 (Beijing Time), Mar.14,1995. Documents received after that date and time will not be accepted.

Before you step into this scene, please learn by heart the following words and expressions with your classmates by looking up the dictionary or surfing the internet.

tender	n. 招标，投标
prequalification	n. 预选（审）资格
inland	adj. 内地的，国内的
navigation	n. 航行，航海，航空
bid	（for）报价，投标，投标，承包，出价竞购
hereinafter	n. 下文中，后文中
authorize	v. 授权，批准，审定
ltd	有限，有限（公司）
bidder	n. 出价人，投标者
furnish	v. 供给，提供，保证
non-refundable	adj. 不退款的，不能偿还的
postage	n. 邮费，邮资
courier	n. 信使，送急件的人
fax	n. 传真
telex	n. 用户直通电报，用户电传（打字）电报，电传

China International Tendering Company 中国国际招标公司

China National Technical Import & Export Corporation
中国技术进出口公司

Hunan Xiangjiang Navigation Construction & Development Corporation Ltd.
湖南湘江航运建设开发有限公司

Supply the missing information in the following table according to the Tendering Notices you have just read.

	Notice
Tendering Unit	
Employer	
Name of the Project	
Bid Number	
Finance Source	
Contract to be signed	



Time and Date of Obtaining Bidding Documents	
Place of Obtaining Bidding Documents	
Payment for Each Set of Bidding Documents	
Deadline of Receiving Application	

Translate the following expressions into Chinese or English.

（1）开标 _____

（2）_____ call for bids

（3）国际竞争招标 _____

（4）_____ bid for a new building

（5）国际招标公司 _____

Translate the following sentences into English which should include the expressions given in the brackets.

（1）那个招标通告是 1995 年 1 月 26 日在中国日报上公布的。（invitation for bids）

（2）他们将以国际竞争招标方式采购一批上述工程所需的材料。（by way of ICB）

（3）欢迎有兴趣参加投标者与中国进出口公司联系，索取招标文件。（participate in the bid; be kindly requested to）

Write a notice of invitation for bids covering the following information.

Tendering Unit: CMC International Tendering Company(CMC ITC)

Employer: Shenyang Machinery & Electric Equipment Corporation(SYMEEC)

Name of the Project: Liaoning Environment Project

Bid No: CMC 9501104

Finance Source: a loan of US$110 000 000 from the World Bank in various currencies

Contract to Be Signed: Anshan Wastewater Project:Treatment Plant Equipment and Instrumentation ,Contract AWW/22.0

Time and Date of Obtaining Bidding Documents:
between 9:00 and 11:00 am from Jan.27 to Mar.0,1995(Beijing Time)

Place of Obtaining Bidding Documents:
CMC ITC
Room 11106,Main Building,Xiyuan Hotel,
No.1,Sanlihe Road, Xijiao,Beijing,China

Payment for Each Set of Bidding Documents:
RMB 900 or US$100(non-refundable)

Deadline of Receiving Application:
11:00 am on Mar.2.1995

Post Code: 100046

Tel: (010)68325778 ext.11106
Fax: (010)68325779
Telex: 22881 CMIEC CN

Practice spoken English.

Mr. Yang: Morning!
Mr. Smith: Morning!
Mr. Yang: Do you know about the writing of Notice of Invitation for Bids?
Mr. Smith: Yes, there are six elements in writing it.
Mr. Yang: Could you describe it in detail?
Mr. Smith: OK. Headline, Name of Tendering Unit ,Name of the Project, Bid of Number, Body Copy, Supplementary Items.
Mr. Yang: Can you give me an example about how to write it?
Mr. Smith: Yes ,of course, here you are the sample.
Mr. Yang: I'm really very grateful to you .
Mr. Smith: Not at all.

Scene Two Product Specification

产品说明书是帮助用户认识产品，指导用户使用产品的书面材料，它对产品的结构、功能、特性、使用方法、保养、维修，注意事项等做出详细的解释说明，既介绍产品又传授知识和技能。

由于产品的种类、性质不同，其说明方法、内容也不同，机械产品说明书的内容一般包括产品特点、用途、规格、结构、性能、操作程序及注意事项等。

由于说明书文体旨在介绍使用方法、操作方式或注意事项等，因此它的文体特点为简略性、技术性、描述性和客观性。简略性表现为内容简略，文字浅显，句式简单，大量使用祈使句和省略句，避免使用不必要的修辞手段。说明书中文字大多涉及某方面的专业知识，即使是一般家用电器的使用说明书也具有技术性，工用机械说明书技术性就更强。描述性表现为文字具有层次感、程序性和说服力。产品说明书主要是让消费者了解产品的性能、特点等，因此语言客观，用在说明书中的词语应该恰当、如实地反映产品的真实情况。

产品说明书的式样多种多样，但在写法上有许多共同的地方。一般说来，产品说明书大多都由标题、正文、落款三部分组成。

产品说明书不同于其他文体，我们需要掌握其文体和语言等特征，用符合说明书的语言如实地将产品说明书的内容翻译出来，其次还需要了解产品的基本原理等相关专业知识。请参阅下例。



Introduce of Philips desk light

Thank you for your purchase of a Philips desk light!

Caution Warnings

For you protection, please read this manual and the safety warnings carefully before using the desk light and keep it for later reference. The manufacturer will not be held responsible for any damages caused by improper usage or modifications to the desk light .

Electrical Specifications

Voltage/Frequency:	220V~50Hz
Power/Lamp:	27W/PL-F 27W/4P
Lampholder:	GX 10q-4
Electrical Insulation Classification:	II

Operation Instructions

This desk light is not waterproof and is only suitable for indoor usage.

No alterations of any kind should be carried out on this desk light.

Do not use any voltage exceeding a 10% margin of the specified standard.

Do not touch the lamp inside or the lamp shade when the power is on .

Do not place flammable material near the desk light .

In case of operation failure , please switch off the desk light , unplug the power cord and contact your nearest Philips dealer.

This desk light is suitable for Philips PL-F/4P 27W compact fluorescent lamps only.

Installation

Take out the desk light body, base and clip.

To use the desk light with the base, insert the stem onto the base plate and tighten the fixing screw.

To use the desk light with the clip, mount the clip onto the desired surface and tighten the fixing screw , then insert the stem onto the clip .

The supplied clip is not suitable for use on tubes.

Maintenance

In order to ensure optimum performance , we recommend you to clean the desk light twice a year. When cleaning the desk light take care to use soft cotton cloths only.

Do not use chemical solvents to clean the desk light, it might damage the painted surfaces.

Caution: Please turn off the power and unplug the desk light before replacing the lamp!



Complete the following sentences with the appropriate expressions given below. Change the form where necessary.

switch on	switch off	turn on	turn off	be suitable for

（1）As he entered the dark basement , he_____the light.

（2）He _____the road when he ought to have gone straight.

（3）He _____the radio to listen to the news.

（4）You should _____the light when you leave the room.

（5）This desk light is only_____ indoor usage.

 Translate the following sentences taken from the passage into Chinese.

（1）For you protection, please read this manual and the safety warnings carefully before using the desk light and keep it for later reference.

（2）The manufacturer will not be held responsible for any damages caused by improper usage or modifications to the desk light .

（3）In case of operation failure , please switch off the desk light , unplug the power cord and contact your nearest Philips dealer.

（4）To use the desk light with the clip, mount the clip onto the desired surface and tighten the fixing screw , then insert the stem onto the clip .

（5）In order to ensure optimum performance , we recommend you to clean the desk light twice a year. When cleaning the desk light take care to use soft cotton cloths only.

 Reading the following introduce of shaver and trying to translate the passage into Chinese.

CHARGING

*Recharge and keep the appliance at a temperature between 5℃ and 35℃.

*The appliance is suitable for mains voltages ranging from 220V to 240V.

*To optimize the life of the appliance , do not leave the shaver connected to the mains continuously.

（1）Slide out the slide pin.

When charging, make sure the appliance is in OFF position.

（2）Put the appliance into the socket.

The green pilot light will light up.

Charging normally takes approx.8 hours.

（3）Remove the appliance from the socket when the battery has been fully charged. A fully charged shaver has a shaving time of up to 30 minutes.

（4）Retract the slide pin.

SHAVING

（1）Switch the appliance on by pressing the switch lock and push the ON/OFF button upwards.

The switch lock will prevent accidental switching-on of the appliance.

（2）Move the shaving heads quickly over the skin , making both straight circular movements.

Shaving on dry face gives the best results.

Your skin may need 2～3 weeks to get accustomed to the shaving system.

（3）Switch the appliance off.

（4）Put the protective cap on the shaver to prevent damage.

Replace the shaving heads (type HQ 3 Double Action) every 2 years for optimal shaving results.

CLEANING

*Regular cleaning guarantees optimal shaving performance.

*Make sure the appliance is switched off and disconnected from the socket when you clean the appliance.

*Clean the shaving unit every week.

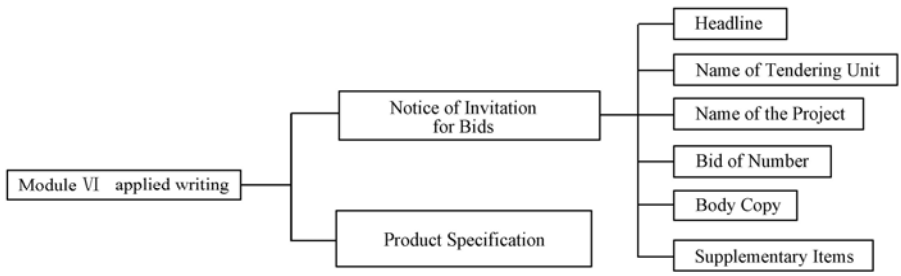
（1）Clean the top of the appliance with the supplied brush.

（2）Press the release button and remove the shaving unit.

（3）Brush the inside of the shaving unit and the hair chamber.

（4）Put the shaving unit back onto the appliance.

Self assessments



Time _____ Class _____

No.	Name	Evaluation Items				Notes
		Attitude	Presentation& Passage	Exercises	Activities	

Teachers' Observation Record and Evaluation Sheet

item / level	listening	speaking	reading	writing	familiarity of parts
good					
better					
best					
bad					





New words

a great deal of	大量的
a small portion of	小部分
a small proportion of	小部分
abatement	消除
able	有能力的，能干的
able to+动词原形	能，会
abrasion	擦伤，磨损
abrasive	摩擦（损）的
absolute mode	绝对方式
absorb	吸收，吸引
acceptable	可接受的
accomplish	达到，做到，完成
according to	根据，视……而定，按照
accuracy	精确性，正确度
accurate	正确的，精确的
accurately	正确地，精确地
acid cleaner	酸洗液
actuate	开动，促使
adjacent	邻近的，接近的
adjust	调整，调节，使适合
adoption	采用
advance	前进，推进
advent	出现，到来
advisability	明智
advisable	可取的，明智的
aeronautics	航空学
aggregate	组合的
aggregate machine tool	组合机床
aggregation	聚集，集合体
align	对准，排成直线，排列
alignment	队列，对准，同轴度
allowance	（加工）余量，容差
alter	改变
always	总是，始终
analogy	类似，相似，模拟
analyze	分析，分解
angular	有角的
angular misalignment	角位移，角偏差
angular surface	斜面
animation	动画片，动画
annealing	退火
anti-clockwise(anticlockwise)	逆时针
apart from	除……以外
appearance	出现
applicable	可适用的，合适的
application	使用，应用
approach	接近，确定
arbor	刀杆，心轴
arc welding	电弧焊
area	范围，面积
arm	臂
arm radial	摇臂
as a result	结果，因此
as a rule	通常，照例
as follows	如下
as result of	……结果，由于
as well	同样，也
as well as	以及，和……一样
assemble	安装，装配，组件
assembly	总成，组件
associate	联合，结合
assume	呈现，表现为……形式
at last	终于
at least	至少
at right angles to	与……成直角
at the rate of	按……速率（比率）
attach	附上，加上
attach to	附在……上
attachment	附件机构，装置



attempt to 试图，企图
attraction 吸引，引力
audit 审计，稽核，检查
automate 使自动化
automatic 自动的，机械的
automatic tool changers 自动换刀架
automatically 自动地
automation 自动化
automotive 自动的，汽车的
automotive industry 汽车工业
auxiliary function 辅助功能
axes 轴（复数）
axial 轴的，轴向的
axial thrust 轴向推力
axially 轴向地，与轴平行地
axis 轴
back and forth 来回，往复
background 背景，后台
backlash 间隙，轮齿隙
balance 平衡
bar 条钢，型钢
base 床身
batch 整批的
batch production 批量生产
be attached to 连接于，固定于
be concerned with 与……有关系
be divided into 分成……
be grouped into 分类的
be known as 称为，叫做
be provided with 装有，备有
be recognized as 被认为是
be subjected to ……易受到……
bearing 轴承
bed 床，床身
belong to 属于
belt drive 皮带传动
bend 弯曲
bending strength 抗弯强度
benefit 利益，好处
bevel 斜角，斜面，斜角的，斜面的
bevel gear 伞齿轮
bilateral 双向的
bismuth 铋
blade 刀刃，刀口，叶片
blank 毛坯，坯料
blow 打击，冲击
body 体，钻体
body clearance 钻体间隙
bolt 螺栓，螺钉，用螺栓固定
bore 镗孔
boring 镗孔
branch 分支，部门
braze 铜焊，硬钎焊
brazing 铜焊（接），硬钎焊
break down 破坏，毁坏，击穿
brine 盐水
Brinell test 布氏硬度试验
bring to bear on 施加（影响，压力），竭尽全力
broad 宽的
broadly 概括地，大致地
broadly speaking 概括地讲
bullet 子弹
bushing 轴套，衬套
by comparison 相比较
by means of 依靠
by no means 决不
by steps 逐步地
cadmium 镉
cage 笼，笼盒，隔离罩
calculate 计算
cam 凸轮，偏心轮
capable 有能力的
capable of 能……的，可以……的
capacity 容量，能力
carbide 碳化物
care 管理，照顾





careful 小心的，仔细的
carefully 仔细地
carriage 溜板，拖板
cast 铸件，铸造
cast iron 铸铁
casting 铸造，铸件
cathode-ray tube(CRT) 阴极射线管
center 中心，顶尖，定中心，打中心孔
center line 中心线
centrifugal 离心的
centrifugal force 离心力
centerless grinder 无心磨床
channel 通道，沟槽
characteristic 特性，特征
characterize 表现……的特色
charge 费用
chip 碎屑，切屑
chisel 凿，錾
chromium 铬
chuck 卡盘，夹住
circle 圆周，圆，环绕
circularity 圆度
clamp 夹子，夹具，夹钳，夹住，夹紧
classified as 分为
climb 攀登，爬
climb milling 顺铣
clockwise 顺时针的，顺时针
close 关闭
close to each other 相互靠近
closely 接近地，紧密地
clutch 离合器
coarse 粗糙的
coat 涂上
coating 涂层
cold chisel 冷錾
column 立柱
come in contact with 同……接触
combination 组合，组合物
combine with 与……相结合
come about 发生，出现
command 命令
comparatively 比较地，相当地
comparison 比较
competitive 竞争的
complete 完成，使完善
complex 复合体
complexity 复杂性
component 元件，组件
component drawing 零件图
compression 压力，压缩
compromise 折中
computer graphics 计算机绘图
computer integrated manufacturing system(CIMS) 计算机集成制造系统
computer numerical control(CNC) 计算机数字控制
computer aided design(CAD) 计算机辅助设计
computer aided manufacturing(CAM) 计算机辅助制造
concentricity 同轴度
conceptual 概念的，构想的
conceptual design 概念设计
conduct 实施，进行
conform 使一致，使……符合，符合
conical 圆锥（体、形）的
considerable 相当大（或多）的，重要的
considerably 相当大地
consideration 考虑
consist of 包含，包括，由……组成
console 安慰，慰问
constitute 构成
consumption 消费
contact 接触，触点，接触



continuous 连续的，持续的
continuously 连续不断地
contour 轮廓，仿形
contoured surface 仿形面，围线曲面
control 控制
control board 控制板
conventional 一般的，常规的
conventional milling 逆铣
conversion 变换，转化
convert 使转变
convert…into 把……变成
conveyor 传送装置，传送带
coolant 冷却液
coordinate 坐标
copper 铜
corrosive 侵蚀的
correspond 符合，相应
corresponding 相应的，符合的，一致的
corrosion 腐蚀
counterboring 平底锪钻
countersinking 尖底锪钻
coupling 联轴节，联轴器
critical 关键的，临界的
critical dimension 重要尺寸
critical range 临界点
critical temperature 临界温度
cubic 立方体的，立方的
curl 使卷曲，使卷边
current 电流
curve 曲线，绘曲线
curvilinear 曲线的
customary 习惯的，通常的
cutter 刀具
cutter grinder 工具磨床
cutting edge 切削刃
cylinder 圆筒，圆柱体
cylindrical 圆柱（体，形）的
data processing unit(DPU) 数据处理单元
database 数据库，资料库
dead center 尾架顶尖
deal 量，分配
deal with 处理
debug 调试
decimal 十进的，小数的
decimal point 小数点
declining 倾斜的，衰退中的
decode 解码，译码
deep 深的
deflection 偏转，挠曲
deformation 变形，挠曲
degree 度，程度
deliberately 故意地
delivery 递送，交付
denote 指示，表示
derive 派生，起源
describe 描写，记述
design 设计
designer 设计师
detriment 损害，损害物
deviation 偏差
devise 设计，发明
die 冲模，锻模
dimension 尺寸，标尺寸
direct current=D.C 直流电
D.C.motor 直流电机
direction 方向，指导
discharge 放电
discover 发现
dishwasher 洗碗机，洗碗的人
dismantle 分解（机器），拆开
dissimilar 不同的，相异的
distinguish 区别
distortion 变形，歪曲
dog 挡块，鸡心夹头
double 两倍的，使加倍，加倍
double-acting 往复式的
double-housing planer 双立柱（臂）龙门刨床
double-row radial bearing 双列径向轴承





down milling 顺铣
downward 向下的
drafting 制图
draw 拉伸
drawing 绘图，拉长
drill 钻床，钻孔
drill press 钻床
drilling 钻削
driven element 被动元件
driver 发动机，主动轮
driving element 主动元件
drop forging 模锻，落锤锻
ductility 延（展）性，韧性
due to 由于
dull 变钝，弄钝，钝的
durable 持久的，耐用的
duty 责任，功率，税
dynamics 动力学
edge 刀口，刀刃，边缘
efficient 有效率的，能干的
either…or 或……或，不论……还是…….
elastic 弹性的
elastic deflection 弹性（挠曲）变形
elasticity 弹性
electrical 电的，电力的
electrical discharge machining(EDM) 电火花加工
electrically 用电，电学上
electricity 电，电学
electrochemical 电气化学的
electrochemical grinding 电化学磨削
electrochemical machining 电化学加工
electrode 电极
elevate 升高，提升
eliminate 排除，消除
empirical 经验的，实验的
employ 使用，采用
encompass 包含或包括某事物
energy 能力，[物]能量
engage 接合，啮合
engine 发动机
engine lathe 普通车床
enlarge 扩大
enough 足够的，充足，足够地
entire 全体的，完全的
entirely 完全地，彻底地
environmental 周围的，环境的
envision 想象，预想
equation 相等，方程式，等式
equator 赤道
equipmen 装备，设备，装置
erosion 腐蚀，侵蚀
erratic 不稳定的
essential 主要的，根本的，基础
establish 确定，建立
even if 即使
even number 偶数
even though 即使
evenly 均匀地，平坦地
eventually 最后，终于
evolve 进化，演变
examine 检查，调查，考试
exceptionally 格外地，异常地
excess 过度，超过，过度的
exert 发挥，施加
experimental 试验（用）的
explain 解释，说明
extend 扩充，延伸
exterior 外面的
exterior cylinder 圆柱体外表面
external grinder 外圆磨床
fabric 纤维品，构造
factory 工厂
Fahrenheit 华氏温度计的，华氏温度计
failure 故障，断裂
familiar 熟悉的



familiar with 熟悉……的
fasten （使）固定，加固，连接
feed 进给，送给
fibric belt 纤维带
fine 好的，优良的，精细的
finish 精加工，粗糙度，表面抛光，完成
finished piece 完成件
finite-element method(FEM) 有限元方法
fit 装配，配合
fix 解决，调整，修理
fixture 夹具
flatness 平面度
flexibility 机动性，挠性
flexible 灵活的，能变形的
flexible manufacturing system(FMS) 柔性制造系统
fluid 流体，液体，
flute 凹槽，螺旋槽
flux 助熔剂，焊剂
follower 从动件，随动件
footstock 尾架，尾座
for instance 例如
forge 锻工车间，锻造
forged weld 锻焊
forging 锻造，锻件
form grinding 成形磨削
formed steel 型钢
former 从前的，以前的
formerly 以前，过去
found application in 在……方面得到使用
four-jaw(independent)chuck 四爪（分动）卡盘
fracture 断裂，破裂
framework 构架，框架
frequency 频率，频繁
frequent 时常发生的，频繁的
frequently 常常，屡次
frictional 摩擦的
function 作用，[数]函数
fundamental 基本原则，基本原理
fundamentally （从）根本上
furthermore 此外，而且
fuse 熔合
gap 间隙
gauge 量规
gauge block 量块
gear 齿轮
gearing 传动装置，齿轮装置
geometric 几何的，几何学的
geometry 几何形状，几何学
grain 晶粒
graphics 制图学，图形
gravitational 重力的
gravity 地心引力，重力
grinder 磨床
grinding machine 磨床
groove 沟，槽，开槽
group technology(GT) 成组技术
handle 柄，把手
harden 淬火
hardened steel 淬硬钢
hardness 硬度
hardware 零件，附件，硬件
headstock 主轴箱
heat treater 热处理工作者
heat treatment 热处理
heat-resistant 耐热的
heat-resistant steel 耐热钢
heavy-duty 重型的
helical 螺旋形的
helical gear 螺旋线
herringbone 人字形，箭尾形的
herringbone gear 人字齿轮
high-speed 高速的
high-speed steel 高速钢
hinder 阻碍，打扰
hob 滚刀，滚铣
hobbing 滚铣，滚齿





hobbing machine 滚齿机
hold 拿着，固定，夹持
holding fixture 夹具
honing 珩磨
horizontal 水平的，水平线
housing 套，壳，罩
hub 衬套
hydraulic 水力的，液压的
hydraulic motor 液压马达
hydraulic press 液压机，水压机
i.e.=that is 即，就是
ideal 理想的
identical 同一的，相同的
immediate 直接的，立刻的
immediately 立即，马上，直接地
impact 冲击
implement 完成，实现，执行
implemented 实行，执行
impression 凹膛，压痕，型腔
in a similar way 同样
in addition 此外
in an efficient manner 用有效的方法，有效地
in contact with 与……接触
in contrast 相比之下，相反，可是
in effect 有效
in opposite direction 朝相反方向
in other instances 在其他情况下
in the direction of… 朝……方向
in the fifties 在五十年代
in the form of 以……形式
in this way 这样
incorporate 合并，混合
incremental mode 增量方式
indentation 压痕，压坑
index （铣床）分度头，指针
indexing table 分度工作台
indicate 指示，读数
indiscriminately 随意地
individual 个人，个体，个别的，单独的
individualize 个别地加以考虑
individually 个别地
infeed 横向进给
infinitely-variable speed 无级变速
ingot 铸锭，钢锭
inner 内部的，在内的
innovative 创新的，革新的
innumerable 无数的
in-process gaging 在线检测
inspection 检查
instance 例子，情况
instant 立即的，直接的
instruction 指令，命令
instrument 工具，器械
insulator 绝缘体
intend 想要，打算
intensity 强烈，强度
interchange （指两人等）交换
interchangeable 可互换的
interchangeably 可互换地
interfere 干涉，妨碍
interference 过盈，干涉
interference fit 过盈配合，压配合
interior 内（部）的
interior cylinder 圆柱孔
internal grinder 内圆磨床
internal grinding attachment 内圆磨头
internal stress 内应力
interpret 解释说明
intersect （直线）相交，交叉
inventory 存货，总量
investigate 调查，研究
involve 包含，涉及
irregular 不规则的
irregularly 不规则地
ISO 国际标准化组织
itself 它本身，它自己
jaw 爪



jig 钻模
join 连接，结合
joint 连接缝，接合处
judge 判断
jump 跳
key 键
kilogram 千克，公斤
kinematic 运动学（上）的
kinematics 运动学
knee （铣床）升降台
labor cost 劳动力成本
lateral 横（向）的
lateral feeding movement 横向进给运动
lathe 车床，用车床加工
latter 后面的
lead time 交货时间
lead to 导致
least 最小的，最少的，最小，最少
leather 皮革
lessen 减少，减轻
letter address 字母地址
lever 杆，杠杆
line 线
linear 直线的，线性的
linear motion 线性运动
linkage 连接
lip 缘，刀刃，切削刃
live center 主轴顶尖
load 负载，载荷
locating and holding device 定位和夹紧装置
lose contact with 与……脱离接触
lubricant 滑润剂
machine building industry 机械制造业
machine centers 加工中心
machine control unit (MCU) 机床控制单元
machine tool 机床，工具机
machinery 机器，机械
machining center 加工中心
machinist 机械师，机械工人
maintenance 维护，保持
make one' (first) appearance （首次）出现
manganese 锰
manner 方法，方式
manufacture 大规模制造，生产
manufacturing 制造业
margin 刃带，边界，界限
mass 物质，质量
mass production 大批量生产
mate 配对物，配合，配成对
matter 事件，物质
meaning 意义
mechanical 机械的
mechanical drawing 机械制图
medium 介质，中间的
mesh 啮合，配合
mesh with 与……啮合
metalwork 金属制品，金属制造
metrologist 计量师
metrology 计量学，计量制
micrometer 测微计，千分尺
microprocessor 微处理器
mill 铣床，铣刀，铣，铣削
milling 铣削
milling machine 铣床
minimize 最小化
minimum 最小值，最小（值）
minor 较小的，次要的
minus 负的，减去的，负量，负号
misalignment 不对准，偏差
miscellaneous function 辅助（杂项）功能
misplace 放错地方
moderate 中等的，适中的
modification 更改，修改
modulus 模数
modulus of elasticity 弹性模量
molybdenum 钼





motionless 不动的，静止的
mount 固定，安装
move 运动，移动
multiple-point tool 多刃刀具
mylar 聚脂薄膜
nalogue 模拟量
narrow 狭窄的
near 接近，靠近，
near to 接近
nearly 将近，大约，几乎
nickel 镍
nominal 名义上的
nonconducting 不导电的
notation 符号，标志
notched wheel 棘轮
numerical 数字的
numerical control(NC) 数字控制
numerically 用数字，数字上
nut 螺母，螺帽，上（拧，装）螺母
obey 服从，顺从
obtain 获得
obtuse 钝的，不快的
odd 奇数的，单数的
on-line 在线的，即时的
open-side planer 单立柱（臂）龙门刨床
operation 运转，操作
operation code 操作码
opposite 相对的，对面的
oppositely 在对面，相反的
optimal 最佳的，最理想的
option 选项
orbit 轨道
original 最初的，原始的
outer 外部的，外面的
outline 外形，轮廓
overall 全部的，全面的，总的
overall cost 总成本
overlap 重叠，相交，（部分）一致
oxide coating 氧化膜
oxyacetylene welding 氧—乙炔焊
oxyacetylene 氧乙炔的
painful 费劲的，使痛苦的
pallet 棘爪，货盘
paper tape 纸带
parallel 平行的
parallel to 平行于
parity 奇偶校验
particle 微粒
particular 特别的，单个的
pawl 棘爪
peel 削，剥落
pendulum-type impact test （摆锤式）冲击试验
per 按照，根据
perceive 察觉，看见
perform 执行，完成
performance 履行，执行
periphery 圆周，圆柱表面
permanent 永久的，持久的，
permit 许可，允许
perpendicularity 垂直度
perspective 透视，透视法，透视画
physical properties of a material 材料的物理性能
physical property 物理性能
pick up 拾起，采集
pinion 小齿轮
piston 活塞
piston type 活塞型的
place 地点，位置，放置
planer 龙门刨床
planner 计划者
planning 刨削
plant 工厂
plastic 塑料的，可塑的
plastic deformation 塑料变形
plate 金属板
plunge-cut grinding 横向全面进给磨削



plus	正的，略大的，正量
point	点，刀尖，钻尖
point-to-point	点对点
portion	部分
positive	正的，肯定的，阳性的
positively	确定，确实地，正
positive-motion drive	强制转动
possibility	可能性
potential	潜能，潜力
powerful	强有力
precise	精密的，精确的
precision	精度
preliminary	预备的，初步的
preparatory function	准备功能
present	介绍，呈现，提出，显示
press	压，冲压，压力机
primary	第一位的，初级的
primary motion	主运动
principle	原理，原则，主要的，首要的
procedure	规格，规程，程序
proceed	进行，发生
processing parameter	加工参数
product quality	产品质量
production run	生产（运行）周期
productivity	生产率，生产能力
programmer	编程员
prolong	延长，拖延
propeller	推进者，推进器
proportion	比例，部分
proportional	比例的，相称的
pulley	皮带轮，滑轮
pulsate	脉动，波动
punch	冲床，冲孔， 穿孔
punched tape	穿孔带
punching	冲孔，穿孔
quenching	淬火
rack	架，齿条
radial	半径的
radial drilling machine	摇臂钻床
radially	沿径向
radius	半径
rail	轨，铁轨
rake	前角
ram	滑枕
random	任意的，随便的
rapid	快速的，快的
rapidly	快，迅速的
ratchet	棘齿
rate	率，比率，速度
rather than	而不
ratio	比，比率
raw material	原材料
reach	到达，达到
reaction	反应，反作用
real time	实时
ream	铰孔
reamer	铰刀
reciprocate	来回往复运动
recognize	承认，认识
recommend	推荐，介绍
refer to	指的是，称为
reference	参考，基准面
reference surface	基准面，参考面
regard	认为，考虑
regard…as	认为……是
regardless of	不管，不顾
regrinding	重磨
regular	规则的，对称的
reheating	重新加热
relationship	关系
relative to(be)	相对于，关于
release	释放
relevant	有关的
removal	移动，切除
replace	替换，代替，把……放回原处





report 报告，通报
resilience 有弹力，恢复力
resizing 尺寸再生
result 结果
result from 起因，由来
result in 导致，结果形成
return 返回，退回
return stoke 返回行程
reverse 相反，背面，倒退，相反的
reversely 相反
review 重查，评论，回顾
revision 修正，修改
revolve （使）旋转
remove rifle 旋转，运行
rifle 步枪
rigid 刚性的
rigidity 刚性，硬度
ring 环，圈
rivet 铆钉，铆接，铆
rocker mechanism 摇杆机构
Rockwell test 洛氏硬度试验
roll 轧制，滚轧，卷轴，轧辊
roller 轧辊
rolling 轧制，滚轧
rotate 回转，转动
rotation 回转，转动
rotational 旋转的，循环的
rough turn 粗车
round 圆的，围着，围绕着
row 排，列
rpm=revolution per minute 转/分
rubber 橡胶
scale 氧化皮，测量，起氧化皮
schedule 进度表
scrap 废品，废料
scratch 划痕
seal 封，密封
sealing 密封
secure 保证，获得，可靠的，安全的
segment 段，节
select 选择
selector 选择器
selector lever 选速手柄
self 自己，自行
self-aligning ball bearing 自位滚珠轴承
self-contained 独立的，配套的
self-hardening steel 自硬钢
semi-permanent 半永久的
sensitive 敏感的
separate 分离的，个别的，分开
separator 隔离罩，隔板，分离器
sequence 继（连）续，一连串
shaft 轴
shank 钻柄
shaper 牛头刨床
sharpen 使锐利，变尖
sharpness 锐利，尖锐
shear 剪（切）
sheet 张，片，薄钢板
shock 冲击，振动
shop floor 车间
shortcoming 缺点，短处
significant 重大的
simple 简单的
simplify 单一化，简单化
simulation 真，模拟
simultaneous 同时的
simultaneously 同时地
single blow 一击，一下子
single point tool 单刃车刀
single point tool 单刃刀具
single-point cutting tool 单刃刀具
sintered carbide 硬质合金
size 大小，尺寸，加工到一定尺寸



slide	（使）滑动，（使）滑行，滑动
slippage	滑动量，滑程
slippery	光滑的
slit	切开，切口，切缝
slot	缝，狭槽
socket	钻套，插口
solder	焊料
soldering	锡焊，软钎焊
somewhat	稍微，有点
sophisticated	复杂的
sound	健全的，坚固的
space-age	空间时代
spacer	衬套，衬垫，垫片
spark	火花，电火花
specific	特殊的
specification	规定，技术要求，规范
specimen	样品，试样
speed ratio	速比
spelter	硬钎焊料，锌铜焊料
spelter solder	硬焊料
sphericity	成球形，球（形）度
spindle	轴，主轴，连接轴
spiral	螺旋形的，螺纹的
spiral groove	螺旋槽
spot facing	锪端面
spot welding	点焊
spring	弹簧，弹回
spur	刺激，齿
spur gear	直齿轮
squareness	方（形），垂直度
stainless	不锈钢
stamp	冲压
stamping	冲压
stand	站，经受
stand up to	经受（得住），耐
standard	标准
standardize	标准化
steam	蒸汽
steam engine	蒸汽机
steam hammer	蒸汽锤
stearine	甘油，硬脂
steel belt	钢带
stepping motor	步进电动机
stiff	刚（性）的
stiffness	刚度，强度
stimulate	刺激，激励
stock	台，座，储存，供应
straight	直的，直线的
straight cut	直线切割
straight-line	直线
straightness	直线度
streamline	流线型的
strength	强度
stretch	伸展，伸长
strip	条钢，带钢，狭条
stroke	冲程，行程
subassembly	组合件，部件
subject	使……受到
subject to	受……支配的，以……为条件的，易受……的
subject	题目，主题，科目，从属的，易受……的，使受到，使服从
subsequent	后来的，并发的
subsequently	其后，接着
substance	物质
substantial	实质的
substitute	代替者，代替，替换
subtraction	减少
successive	继承的，连续的
supervision	监督，管理
supply	提供，电源，提供，供应
supply…with(for，to)	… 把……供给……
surface finish	表面粗糙度
surface grinder	平面磨床
surplus	过剩，剩余





surplus stock 余量
suspend 吊，悬挂
sustain 支持，维持
swivel 旋转
symbol 记号，符号
synchronize 同步
system 系统，体系，制度
table 工作台
tailstock 尾架，尾座，顶针座
take…into consideration 对……加以考虑，考虑到
take care of 照看，留心，处理
tang 柄舌
tap 攻丝螺纹
tape format 纸带格式
taper 锥形，锥度，逐渐变细
tapping 攻丝，攻螺纹，穿孔
tedious 单调乏味的
tempering 回火
tension 张（拉）力，拉伸
term 术语
termination 终止
terminology 术语，专门名词
the Electronic Industries Association (EIA) （美国）电子工业协会
the former 前者
the latter 后者
theoretical 理论的
thoroughly 完全地，彻底地
thread 车螺纹
threading 攻丝，车螺纹
three-dimensional surface 三维曲面
three-jaw(universal)chuck 三爪（万能）卡盘
thrust 推力，牵引力
thrust type of bearing 推力轴承
time-consuming 费时的
time-saving 省时的
too…to 太……以至于不能
tool bit 刀头
tool head 刀具头架
tool life 刀具寿命，刀具耐用度
tool post 刀座，刀架
tool steel 工具钢
tooling 工夹具，工艺装备
tooling charge 工具（刀具）费用
toughness 韧性，韧度
transfer 移动，传递，转移
transfer machine 传送机
transmission 传动，传输
transverse 横向的，横梁
traverse-cut grinding 横向磨削
tremendous 极大的，惊人的
tungsten 钨
turn 车削
twist 扭转
twist drill 麻花钻
typical 典型的，标准的
undue 过度的
uniformity 均匀性，一致性
unify 统一，使成一体
unilateral 单向的
unique 唯一的，独特的
unique to ……所独有的
universal 万能的，通用的
universal grinding machine 万能磨床
up milling 逆铣
utmost 极度的，最远的
vacancy 空缺
vanadium 钒
variation 变化，改变
various 不同的，多样的
Vaseline 凡士林
versatile 多用途的，多方面的
versatility 多功能性
vertical 垂直的
vibration 振动，摇动
vice versa 反之亦然



vickers test	维氏硬度试验	welding	焊接
virtue	优点，功效	well	好
vise	虎钳，台钳，夹具（用虎钳，台钳）钳住，夹紧	whether…or	无论……或……
		wire drawing	拉丝
remove from	从……除去	with the help of	借助于，在……帮助下
vitally	非常	withstand	抵抗，经得起
voltage	电压	wobble	摇晃，摇摆
VS=versus	对，与……相对	word address	字地址
	处理，操作	work out	解决，算出，加工出
wear	磨损，损坏	workshop	车间，工场
wedge	楔，斜铁	worm	蜗杆
	楔入，劈开	worm gear	蜗轮
weld	焊接，熔焊	yoke	刀杆支架
	焊接的	zinc chloride	氯化锌

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